OFFICIAL PUBLICATION OF THE PROCEEDINGS AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

Mar 3

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VOLUME 40, No. 4

AMERICAN

DYESTUFF REPORTER

DEVOTED TO TEXTILE CHEMISTRY • BLEACHING • DYEING • PRINTING • FINISHING

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DYES *designed for* NYLON

Du Pont Dyestuffs

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . THROUGH CHEMISTRY

DU PONT NEUTRACYL—
neutral dyeing colors—

have been designed specifically for nylon . . . to produce the *highest possible light fastness.* They can be applied in the same time cycle as acid dyes... but have decidedly superior light and wet fastness.

The NEUTRACYL dyes, such as Yellow 3RD, are recommended for dyeing nylon staple in stock, top or tow form. The dyed staple can then be converted into fabrics requiring superior light fastness—such as upholstery materials, pile fabrics, suitings and shirtings.

NEUTRACYL dyes are suitable for dyeing wool, giving fastness properties similar to nylon.

For information on these new NEUTRACYL dyes . . . or for help on any coloring problem . . . consult our Technical Staff. E. I. du Pont de Nemours & Co. (Inc.), Dyestuffs Division, Wilmington 98, Delaware.

GIANT BLENDERS mean more uniform results, to give you a **SUPERIOR PRODUCT**

This series of powerful Giant Blenders is another example of the special equipment throughout our entire plant built to comply with our own specifications. These blenders make possible more uniformity in standardization of the dyes. Thanks to our more uniform methods of dye-making, Althouse superior dyestuffs enable YOU to produce a superior product!

Chemical Company, Inc.

READING, PENNSYLVANIA

America's First Name in Super Light-Fastness

gives you **all around fastness**

in **Amanthrene*** **BROWN RRD**

A VAT COLOR in paste or double powder form

BETTER FASTNESS Fast to washing, chlorine or peroxide bleaching, soda boiling, sunlight, perspiration, dry cleaning.

BETTER PRINTING Unsurpassed for *printing* of cotton and rayon sports wear, draperies, slipcover fabrics . . . affording the advantages of a homogeneous, *non-drying* paste, or a finely divided dispersible powder.

FINER SHADES Gives a full chocolate shade of brown and, in combinations, meets your precise requirements in blotch work and finer engravings.

WELL WORTH TRYING A.A.P. representatives are ready to show you in your own plant how this superior vat color and others of the Amanthrene range can assure you of finer, faster colors. For a demonstration and individualized data, consult our nearest branch.

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LIXATE BRINE IMPROVES QUALITY OF DYEING

To improve the quality of finished goods by eliminating spots, streaks, and white edges many mills now use saturated Lixate brine in the dye bath instead of dry salt.

When dry salt is added it has a tendency to create areas of concentrated brine around the grains of salt, and these drive excessive quantities of dye into fabrics and cause spots and streaks. Because Lixate brine disperses evenly and immediately through the bath, it helps to eliminate this difficulty and to produce a smooth exhaustion of the dye.

Results at mills that have recently changed from dry salt to Lixate brine indicate that in addition to helping to eliminate re-dyes and achieve greater uniformity of shades, use of Lixate brine also increases plant efficiency and reduces operating costs as well. Because brine is made automatically and piped throughout the plant, the Lixator cuts salt consumption, and also eliminates the work of unnecessary salt handling.

An engineering development of the International Salt Company, Inc., Scranton, Pa., the Lixator consists of a rock salt storage hopper over a dissolving tank with a brine collection chamber. Rock salt flows by gravity into the tank at the same rate it is dissolved, automatically replenishing the supply. Water enters near the top. As water flows downward, it dissolves the rock salt until it becomes fully saturated some distance from the bottom of the tank. From that point on the remaining rock salt acts as a filter bed that removes all insoluble matter from the brine. As a result, when it reaches the collection chamber, the brine is crystal clear and fully saturated.

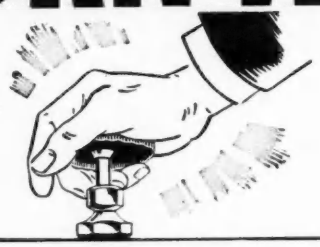
Many mills report that when they use Lixate brine in the dye bath they use approximately 12 per cent less salt than they did when they added dry salt to the bath. This is because saturated brine is more efficient as the exhausting agent than when dry salt is used directly in the machines. One gallon of saturated brine contains 2.65 pounds of salt but when used as the exhausting agent, one gallon of saturated brine appears to be equivalent to three pounds of dry salt. This is the figure used for best dyeing results by actual experience.

Lixate brine is always crystal clear and neutral—free from acids and alkalies—and for that reason is also used to regenerate zeolite water softeners. The same Lixator provides saturated brine for this purpose as well as for use in the dye vats. Lixators may be made in any size to meet individual plant requirements.

JUST TURN IT

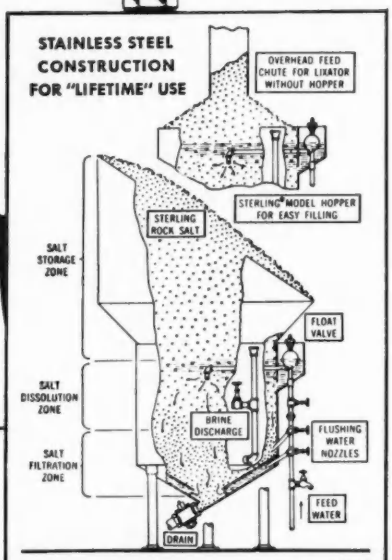
AND GET

BRINE



That's Just Right Without Measuring Or Stirring!

STERLING ROCK SALT
BRINE DELIVERED BY PIPE TO EVERY POINT IN YOUR PLANT
- **DYEING MACHINES**
- **DYEING VATS**
- **ZEOLITE WATER SOFTENERS**



• Why trust to "rule-of-thumb" measuring? Why go through the laborious shoveling, hauling, and hand stirring of salt and water? With International's Lixate Process for Making Brine you are assured accurate salt measurement every time. Stops waste through spilling. Saves time and labor.

• The Lixator *automatically* produces 100% saturated, free-flowing, crystal-clear brine which may be piped to as many points in your plant as you wish — any distance away — by gravity or pump. YOU SIMPLY TURN A VALVE to get self-filtered LIXATE Brine that meets the most exacting chemical and bacterial standards.

Savings up to 20% and often more in the cost and handling of salt have been reported by many Lixate users. Why not investigate?

HOW LIXATOR WORKS

In the dissolution zone—flowing through a bed of Sterling Rock Salt which is continuously replenished by gravity feed, water dissolves salt to form 100% saturated brine. **In the filtration zone**—through use of the **self-filtration** principle **originated by International**, the saturated brine is thoroughly filtered through a bed of undissolved rock salt. The rock salt itself filters the brine. Nothing else is needed.

WHAT THE LIXATOR PROVIDES

- ✓ **Chemical and bacterial purity to meet the most exacting standards for brine.**
- ✓ **Unvarying salt content of 2.65 pounds per gallon of brine.**
- ✓ **Crystal-clear brine.**
- ✓ **Continuous supply of brine.**
- ✓ **Automatic salt and water feed to Lixator.**
- ✓ **Inexpensive, rapid distribution of brine to points of use by pump and piping.**

An INTERNATIONAL Exclusive

The **LIXATE*** *Process*

FOR MAKING BRINE

*REG U. S. PAT OFF.

INTERNATIONAL SALT COMPANY, INC., Scranton, Pa.

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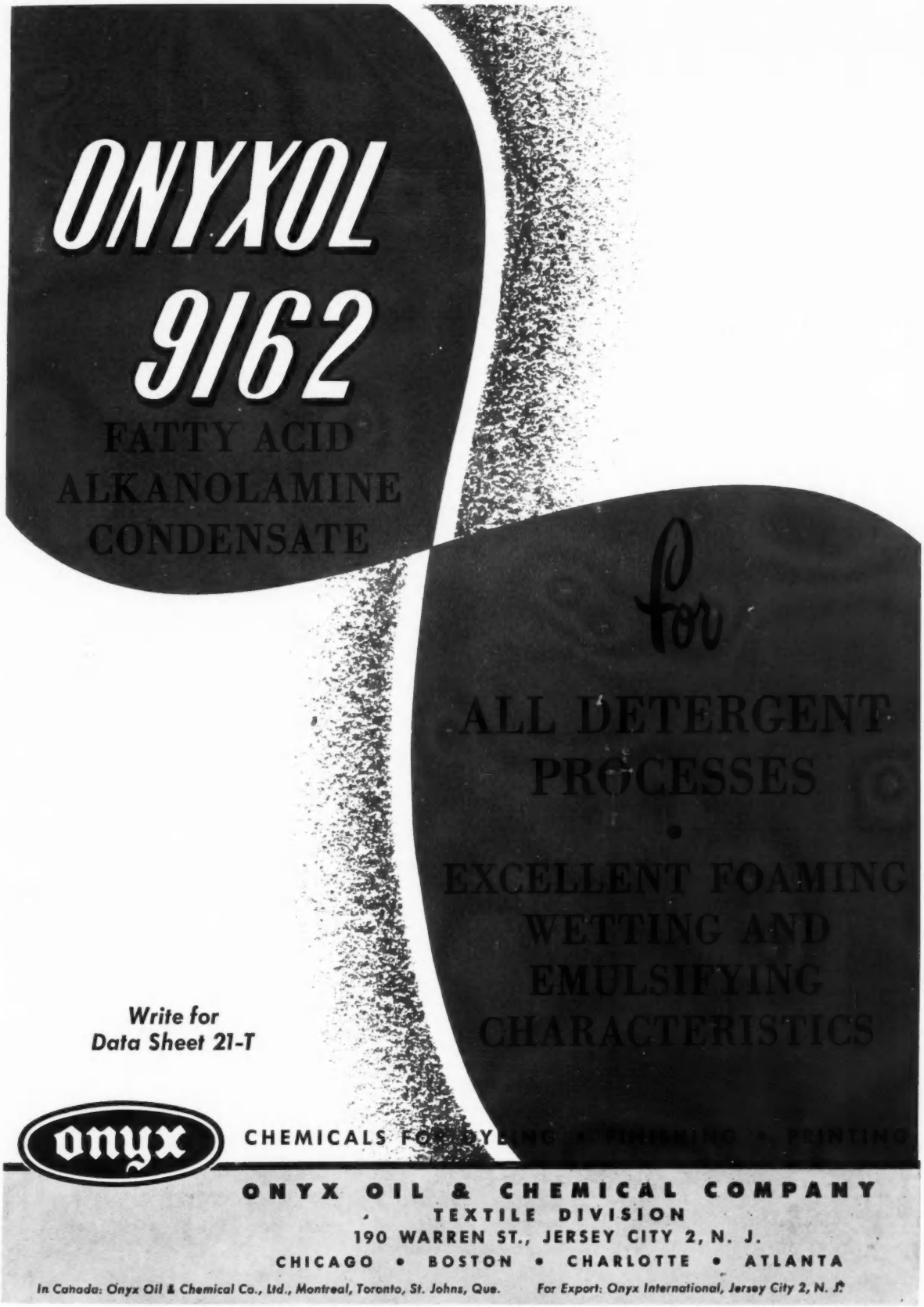
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TEXTILE CHEMICALS DEPARTMENT

serves you with a full-scale research and development program including chemicals for *all fibers, all fabrics.* Write Monsanto today about chemicals described below or for general information on chemicals of special use in your mill. Address: Textile Chemicals Department, Monsanto Chemical Company, Boston 49, Mass. Or, use the handy coupon on the opposite page.

Today... more than ever it pays to use Sterox 6 for wool scouring

While soap prices climb, many mills today are *slashing* wool scouring costs UP TO 50% — using a new, different detergent, Monsanto's Sterox 6.

By switching to Sterox, you use *less* detergent . . . and cut costs; you use *less* Soda Ash . . . and cut costs (see case history below) — yet you get *full* efficiency. Sterox removes grease and oil almost completely AND holds them in suspension without redeposition on the fibers.

STEROX SYSTEM		
	Sterox	Soda Ash
Amt./100 lbs. grease wool	.21 lbs.	1.56 lbs.
Price	@ .32/lb.	@ .015/lb.
Chemical Cost/ 100 lbs. grease wool	.067	.023
Total Chemical Cost 100 lbs. grease wool		.090

SOAP SYSTEM		
	Soap	Soda Ash
Amt./100 lbs. grease wool	.62 lbs.	1.88 lbs.
Price	@ .245/lb.	@ .015/lbs.
Chemical Cost/ 100 lbs. grease wool	.152	.028
Total Chemical Cost 100 lbs. grease wool		.180

For loftier wool . . . for real dollar savings in wool scouring, it'll pay YOU *to investigate Monsanto's Sterox 6 for your mill . . .* TODAY. *The coupon is for your convenience.*

Case history of a dollar doing the work of two... with Sterox 6

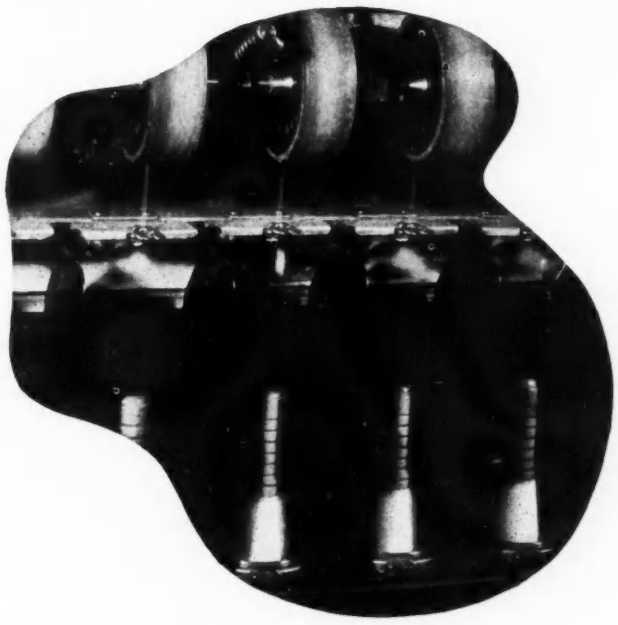
After keeping careful cost records for two weeks with soap, ... mill scoured 99,086 pounds of grease wool with Sterox 6. The wool in both test periods included 58's, 60's and No. 4's in unblended lots. Shrinkage: 30%-40%; residual grease content for both tests: 0.5% or less. Total time: 52 hours; but, during two 8-hour shifts, 20,500 lbs. per shift were scoured to check efficiency of Sterox 6 at peak loads.

Equipment and procedure: Equipment included 4-bowl trains, counterflow from #4 to #1 to centrifuge. Automatic blowdown of bowls 1 and 2. Rotameter feed of chemicals to bowls 2 and 3. *Bowls were not dumped* (liquor lost only during automatic blowdowns).

Results: Scouring cost with Sterox 6 was one-half of the scouring cost with soap. During peak loads, chemical costs were still less. Grease recovery with Sterox was comparable to that in the control test with soap.

Now use SYTON with blends

Syton Produces Greater Yarn Strength In Wool Blends



You've already found Syton, Monsanto's silica dispersion, a profit-booster in woolen and worsted spinning . . .

Now . . . mill trials prove Syton just as advantageous with blends. Smooth rayon staple behaves more like serrated wool fiber when Syton is applied to control inter-fiber slippage. And the proof is in the spinning. Sytonized wool-rayon yarn is 10%-30% stronger; and ends down are fewer—and with Syton you can spin finer counts on all blends, or use *less* twist and get equal yarn strength.

These, and other real advantages, mean *many* production savings all along the line—more profit despite rising costs. You'll want to put Syton to work for you . . . in your plant. So send the handy coupon below for full information.

For full information on Syton*, Sterox 6*, and other Monsanto textile chemicals such as Stymer*, for rayon slashing; Merlon* resins for durable finishes; Resloom*, for washability and wrinkle resistance; Sted*, for cleansing and scouring action; Catalyst AC for curing melamine and urea resin finishes; Dye fixatives; Rezgard*, fugitive-type flame retardant—check and return the coupon. *Reg. U.S. Pat. Off.

MILL A—55-45 wool-rayon blend. Applied 1.5% Syton to wool stock; then blended before carding. Front roll speed increased from 105 to 139 r.p.m.—resulting in over 30% increase in production.

MILL B—50-50 wool-rayon blend. Applied 2% Syton, 3% oil emulsion. Stock carded well and was spun to 3⅛ run yarn. Tensile strength increased from 75 to 89 lbs.—a gain of 18%.

MILL C—80-20 wool-nylon blend. Applied 2% Syton, 4% oil to wool stock; then blended with nylon. Overseer attributed improved spinning to uniformity of sliver and yarn.

MILL D—50-50 wool-Dynel blend. Applied 1% Syton, 2½% oil (based on weight of wool) to blended stock. Spun to 6 run. Good control of fibers, smooth, uniform yarn noted.

MILL E—50-50 wool-viscose blend. Applied 1½% Syton, 3% oil to wool; then blended with rayon. Mill had used Syton for 18 months on blends, including virgin and darnetted wool, acetate, viscose, and nylon, with consistently good results.

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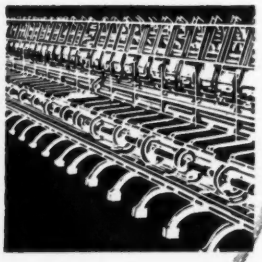
- ☐ Resloom ☐ Sted ☐ Catalyst AC ☐ Dye fixatives ☐ Rezgard
- Name & Title _____
- Company _____
- Address _____
- City, Zone, State _____

for your nylons



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A clear, clean yellow for cellulosic fibers with superior light fastness before and after urea formaldehyde resin treatment.

Recommended as a component color with the very fastest Chlorantine LL types for drapery, upholstery and dress goods fabrics or wherever maximum light fastness is desired.

It is a yellow of comparable light fastness to the very best reds and blues of direct dyeing such as Chlorantine Fast Red 6BLL, Fast Violet 2RLL, Fast Blue FFC, and Fast Blue BCL.

Chlorantine Fast Yellow 2GLL applied on blended fabrics stains wool very slightly while acetate and nylon are reserved white.

For further information send for detailed technical folder.

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Mothproofed with® MITIN
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1. No other type of mothproofing on the market offers more dependable protection, such an amazingly longer life or such a carefully developed scientific background. MITIN* is outstanding in the field!

2. Geigy is set up to protect your good will with a regular periodic technical control program to reassure you that your runs are being properly Mothproofed with MITIN.

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The Geigy Specialist is ready to bring you all facts. Call him in today. He'll tell you how Geigy is set up to guide you through any of the simple MITIN application techniques (in your mill) and to back you with complete technical cooperation from there out. A call for a Geigy specialist entails no obligation. Why not write us today?

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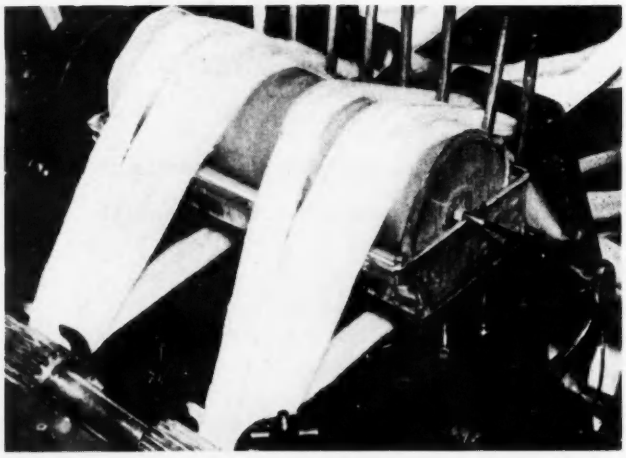
the ¢ FEW extra ¢ents that make a LOT of sense

When it comes to producing worsted yarn, there is always this important question: Should a spinner spend a few more cents than absolutely necessary when processing top, to try and achieve more efficient production and better finished products? In the case of Nopco* 1656-R, the answer is "yes".

Today; the price of top is the highest in history. Thus the few additional cents involved in the purchase of Nopco 1656-R become insignificant in the face of over-all costs. Moreover, the unique advantages afforded by this remarkable oil far outweigh its price differential when compared to alternatives. Just consider:

NOPCO* 1656-R...



1 ***provides excellent lubrication and eliminates static in worsted sliver. Result: no fly from top treated with this oil—fewer ends down in spinning and winding—much less brush waste;***

2 ***increases the drag, and thereby gives a better draft—resulting in more even and cleaner yarn;***

3 ***scours out with phenomenal ease—actually converting into suds when used with alkali, polyphosphate and water;***

4 ***applies equally to all production systems—American, Bradford or French—and is extremely advantageous on pin drafters.***

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Yes, it will profit you to use Nopco 1656-R wherever you employ a lubricant in your top-processing procedure. And it will profit you to specify Nopco 1656-R, as a number of spinners already do, whenever you purchase oil-combed top. You'll pay a few more cents above "rock bottom" perhaps, but when you examine your finished yarns, you'll know you have produced high quality products with surprising economy.

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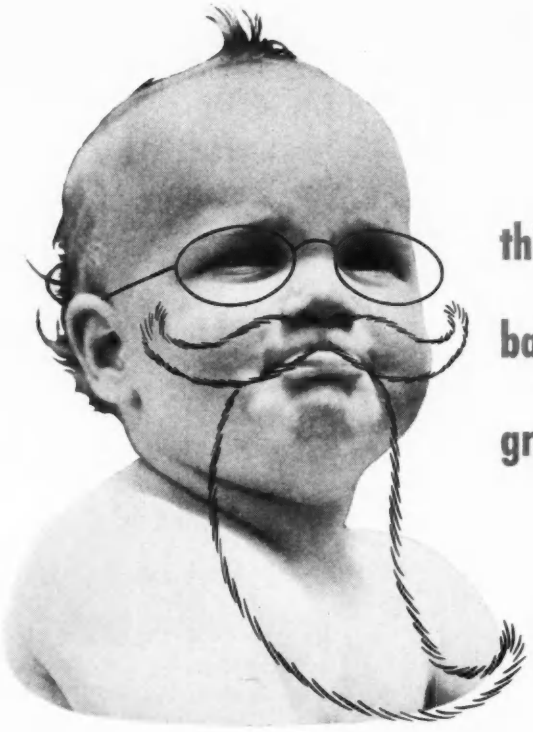
Branches: Boston, Chicago, Cedartown, Ga., Richmond, Calif.

Send for your FREE copy of this bulletin giving detailed information about Nopco* 1656-R



this baby grew...

but fast!

A year ago one of America's great mills asked us to develop a water-repellent that would eliminate plastic liners in baby pants. The specifications were: highest initial spray rating, with a rating of 70 or better after three washings and continued high rating thereafter; no curing at high temperature; no special equipment to be used except ordinary drying equipment.

The answer to this problem was the birth of "CHEM-DRI"—a Zirconium water repellent by Tex-Chem.

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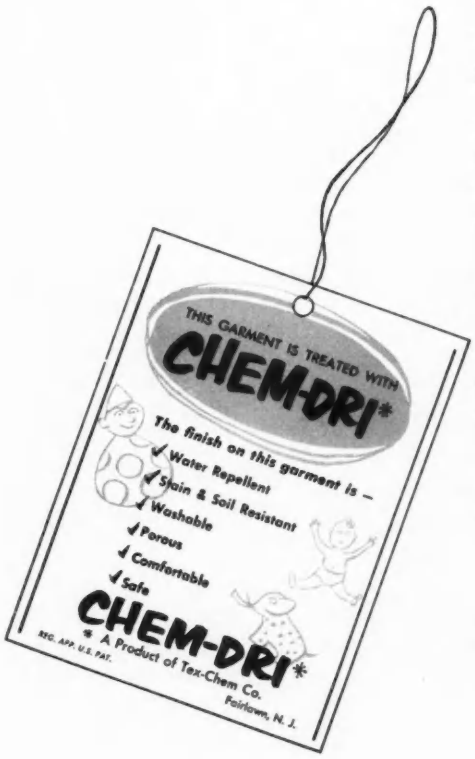
Having cut its eye teeth on the solution to the most difficult problem in the infant wear industry, "CHEM-DRI" is now available for application to the entire textile field.

If you have problems of water-repellency in silk, cotton or rayon, it will be worth your while to look into the possibilities of "CHEM-DRI". We stand ready to furnish you with technical data, product samples; and to demonstrate the application of "CHEM-DRI" right in your own plant!



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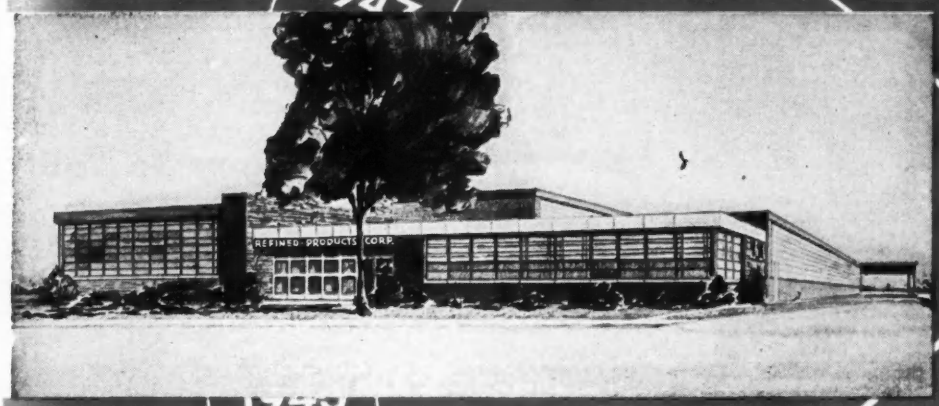

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That is prized•!
To wash it, you're able,
The size remains stable . . .
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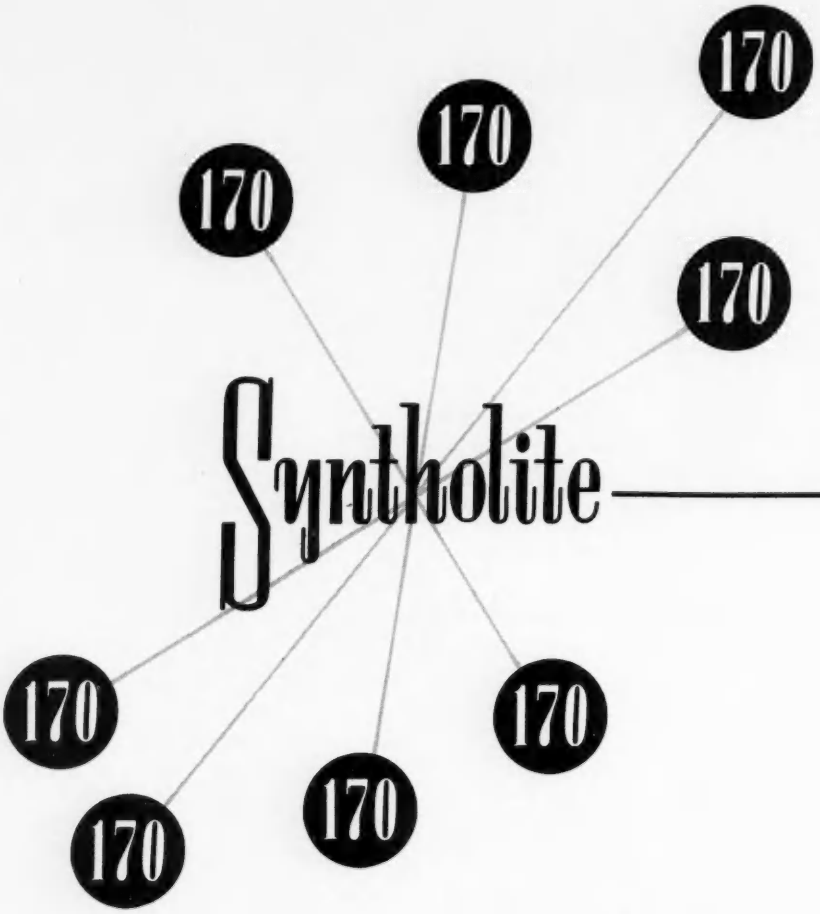

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having trouble dyeing nylon?

Dyeing Nylon is no problem when you make the proper selection of dyestuff and use the correct dyeing procedure. If you run into difficulty dyeing

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- spun-Nylon piece goods
- 100% Nylon or blends of Nylon with acetate or wool
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FEBRUARY 19, 1951

TECHNICAL PROGRAM FOR 1951 NEW YORK CONVENTION

BOTH the National and Sectional Technical Program Committees for the Thirtieth Annual Convention of the Association in New York, N Y, October 17-19, 1951, have been organized, and a tentative program for the technical sessions has been established.

The tentative schedule is as follows:

Wednesday morning, Oct 17, 9:45 A M —National Council Meeting

Wednesday afternoon, Oct 17, 2:00-5:00 P M—Two group technical sessions

Thursday morning, Oct 18 9:00 A M-12:30 P M—Intersectional Contest

Thursday afternoon, Oct 18—Luncheon, followed by Student Contest

Friday morning, Oct 19, 9:00 A M-12:00 noon—Two group technical sessions

Friday afternoon, Oct 19, 2:00-5:00 P M —General technical program

Friday evening, Oct 19,—Banquet and Annual Meeting

GROUP MEETINGS

The group sessions will consist chiefly of contributed papers, classified according to major interest in four general categories, and each group will have a chairman to conduct the meeting and to stimulate discussion following presentation. In the classification into the various groups, emphasis will be along the general lines of processing procedures and mill practice rather than on the specific fibers or fabrics involved. The general subjects to be covered, and the presiding chairmen for the groups are as follows:

Dyeing—E A LEONARD
Printing—F S RICHARDSON
Finishing—W G HELMUS
Auxiliaries and Testing—P J WOOD

Each of these meetings will consist of three to four papers, and an invitation is extended to all members and to others engaged in technical activities in the classifications listed to contribute papers for presentation. Instructions for contributed papers are presented below for your information.

The titles of the group meetings are probably self-explanatory, but the following amplification may be helpful:

DYEING—This group will discuss subjects related to the overall coloring of fibers and fabrics, including the newer synthetic fibers. It is anticipated that special interest may be shown in the field of fiber blends, which are expected to become increasingly important.

PRINTING—Papers related to this special and important method of dye application will be presented in this session. Here again it may be anticipated that printing problems connected with the newer fibers and blends may result in papers of timely interest.

FINISHING—This general subject will include papers related to the processes resulting in desired characteristics of softness, drape, water proofness and many other physical properties of fabrics. Correlation with end use may be an interesting aspect.

AUXILIARIES AND TESTING—This group will consider new product developments, interesting or novel applications of established products, and methods of testing or evaluation of the many assistants used in textile production. Papers dealing with these and related subjects are desired for consideration at this meeting.

GENERAL TECHNICAL PROGRAM —Several papers will be presented by specially invited speakers, and the general theme will be related to end uses and applications of textiles, including quality control, styling, consumer problems and merchandising. These papers should be of particular interest because of New York's position as the garment merchandising center of the country.

CONTRIBUTED PAPERS

The following instructions and regulations have been established governing contributed papers:

1) Anyone desiring to contribute a paper to a group meeting should notify W A Holst, National Aniline Division, 40 Rector Street, New York 6, N Y, as soon as possible, giving the title of the proposed paper and the group to which it is to be presented. The time required for the presentation should be stated (30-45 minutes).

2) When the number of papers available for each group meeting is known, a selection will be made by the Committee, and the contributors will be advised as to whether their papers have been accepted. The program must be completed as soon as possible in order to assure the best possible arrangement of the papers and to provide adequate time for publicity.

3) An abstract of the paper will be required in advance of the program. Contributors will be notified of the date on which this abstract is required.

4) Copies of the completed paper must be in the hands of the Technical Program Chairman by the first week of September so that the necessary arrangements for prompt publication may be set in motion. Earlier submission will be appreciated.

5) Papers must not be primarily of advertising or promotional character. However, the subject matter may consider commercial products, machinery, instruments, or processing procedures of a commercial nature, provided that they are evaluated from a technical viewpoint.

6) The Technical Program Committee must be the final judge as to which papers are to be accepted, but every effort will be made to include all suitable contributions in the program.

SUGGESTIONS

Members may have ideas and suggestions on subjects for presentation at the group meetings. Suggestions as to subjects and also speakers will be appreciated by the Committee. This information should be sent promptly to W A Holst.

The Technical Program Committees:

National—K H Barnard, H Boxser, M A Dahlen, F Dannerth, S J Davis, A W Etchells, H E Hager, V B Holland, R W Jacoby, A D Nute, S H Williams, W G Parks, W A HOLST, *Chairman.*

N Y Section—P J Choquette, W G Helmus, E A Leonard, H E Millson, F S Richardson, C H A Schmitt, P J Wood, W A HOLST, *Chairman.*

UNIFORMITY OF GRADING OF AMERICAN, BRITISH AND GERMAN LIGHTFASTNESS STANDARDS

A Reply to the Fastness-Test Co-ordinating Committee of the Society of Dyers and Colourists*

I H GODLOVE

General Aniline & Film Corporation

Dr Godlove answers the criticism of the British Committee concerning his use of the Adams formula for measuring the degree of fading of standards for lightfastness and his conclusion that the American standards are more evenly graded than the British or German. He contends that the Adams formula is one of the best of the ten available, that it is the most convenient, and that it is especially accurate for small color differences when change of hue (shade) is slight. He also points out that the Adams formula was employed in England by Dr Vickerstaff of Imperial Chemical Industries in a study of pigment fading. He repeats his contention that the American light standards are more uniformly graded than the European.

As a supplement to the point-by-point answer, there is presented a proposal for committee work on light standards that an agreement be arrived at with respect to an instrumental measurement of a "definite break" in fading tests. It is also suggested that, by the use of presently available optical instruments, fastness ratings could be determined with one short and one long exposure of a set of light standards and a sample of unknown fastness. The proposed method is based on the work in which Vickerstaff related the fading of pigments to length of exposure.

INTRODUCTION

I wish to acknowledge receipt of a copy of the comments *(1)*, transmitted in a letter of the 2nd of November, 1950, from L A Lenz, Chairman, (SDC) Lightfastness Sub-committee, through the courtesy of the Editor of the *American Dyestuff Reporter* and the Editor of *Proceedings* with respect to my recent article on "Uniformity of Grading of American, British and German Lightfastness Standards" *(10)*. The five numbered points of that communication will be considered in the order given there, and will be followed by a general statement of some principles of fastness testing, which form a background for some of the questions involved. It is hoped that this will lead to a better understanding of the point of view that led to the paper in question, which was written at the request of the Lightfastness Committee and the Color Committee of the American Association of Textile Chemists and Colorists.

DETAILED ANSWERS TO SOCIETY OF DYERS AND COLOURISTS

1. The Adams "Chromatic Value" formula has been the subject of a number of papers since the Adams method was first proposed in 1942 *(2)*. It has been applied successfully, especially in papers by Dorothy Nickerson of the Color Laboratory of the U S Department of Agriculture. Exactly the same formula for computing small color differences from objective measurements as that used by her and by me, and based on the Adams method, was also used in England by T Vickerstaff and D Tough *(3)*. Apparently Dr Vickerstaff's line of reasoning, which led to choice of the Adams method and the formula for small color differences ("fadings") based on it, was almost identical with mine. Although Dr Vickerstaff visited me not long before, I do not recall discussing measurements used in fastness testing or their background in any but the most general terms. Although his paper preceded mine by four months, it was published long after my measurements and calculations had been reported to AATCC committees. It is perhaps of interest to outline the reasons that led two workers in England and the United States to such similar courses of procedure independently. One point where these two differed will also be mentioned.

There are several formulas in use for expressing small color differenecs in a single number representing a magnitude. In this connection see the papers by Nickerson and others *(4, 5 and 6)*. Each formula derives from a "color space", which is a three-dimensional representation of the relations and differences between colors. The more perfectly these color spaces represent uniform visual spacing, the better the resulting expression of the small color difference, which in practice may be a "fading" or a "color tolerance" in matching. Ten such color-spaces, including the internationally standardized ICI (CIE) system of 1931 and that proposed in 1934 by Dr Deane B Judd of the National Bureau of Standards (and since then actively in use there), were evaluated for a particular problem by R W Burnham *(7)*. Their accuracy was judged by their success in measuring the color-differences between certain colors of the Munsell system, whose local errors of visual spacing had been smoothed out and corrected by a committee of the Optical Society of America*(8)*. These corrections involved systematic observations by 40 highly experienced observers making some 3,000,000 color judgments. Consequently, the resulting Munsell "Renotations" have been quite generally used in this country as the best possible criterion for judging the accuracy of any method of representing color differences and relations.

The Adams method, and the equations derived from it, judged by the Munsell colors and in other ways (which I have frequently used), *is not the most accurate method available.* Indeed, E Q Adams has himself published alternative meth-

* Communication to the Editor of *Proceedings*.

ods more accurate for special purposes. Burnham, for a very restricted range of colors, found the Adams color space ranked in accuracy only third or fourth (though near tbe best) among ten studied by him. But he found it equal to the best in representing hue (dyer's "shade"), while not so good in its representation of Munsell chroma, which is closely related to dyer's "brightness" and "dullness." In testing the Adams method on a much broader range, my own unpublished work shows the Adams method far from perfect. But the important point is that it fails only in a direction which is of no consequence in a small range of hues, such as the blues of the three national sets of lightfastness standards studied in my paper in question. This point should be made clearer in the following paragraph. Incidentally, the Adams formula can be applied in a surprisingly short time, a fact which is true for few if any of the other formulas.

Because of the millions of observations by 40 expert observers on the visual spacing of the Munsell colors, along with the careful instrumental measurements made on them by the National Bureau of Standards, these colors, presenting exemplars evenly spaced visually in three dimensions or attributes, represent by far the best data for testing the value of any method of assaying color differences. (That is, of course, except for the theoretical question as to whether equal multiples of equal small color differences are equal.) Any method of representing small color differences would be ideal if the hues were evenly spaced angularly on a plane diagram, and saturation (Munsell chroma, closely related to dyer's brightness) were shown radially, with contours of constant saturation forming circles. Actually, the lines of constant Munsell chroma, according to the OSA committee's "Renotations" (smoothed and corrected Munsell data), are ovoid instead of circular on the Adams chromaticvalue plot*(9)*. The shortest and longest radii differ by 20% to 40% from the average radius. However, in the (blue) hue region of the lightfastness standards, where a contraction of about 20% occurs, *this is of little consequence* in the present problem. For, within a percent or two at most, this error is present in the same direction for all the colors concerned, thus tending to cancel. And our measurements showed that *we were dealing not with variations of a percent or two, or even twenty or forty percent, but lack of constancy up to one or two thousand percent* in the British standards. Thus it would surely be "straining at a gnat and swallowing a camel" to dwell upon possible errors of the Adams method in a range of colors limited to similar blues. Moreover, it can be readily shown that in fastness testing there are other errors, of much greater magnitude, nearly always present.

There are admittedly two other ways in which the Adams method or formula introduces errors. But again, they become of small consequence when dealing with a small range of colors. Dr Vickerstaff has pointed out the well known fact that blacks, navies and dark browns often "fade" relatively little in "chromaticity" (hue and saturation, or shade and brightness, taken together); instead, they change primarily in the third dimension, lightness, which is measured reflectance or the ICI Tristimulus Value Y. To combine changes in this dimension with chromaticity changes requires some assumption as to the constants of any equation used to convert instrument measurements (Tristimulus Values X, Y, Z) into color differences (as visually perceived). Both Dr Vickerstaff and I used the constants previously used by Nickerson and Stultz for studying tolerances in matching camouflage colors. We differed only in that he chose to use a smaller-sized unit, the "least perceptible difference," in which to express his results. I differ little from him in his recommendation of the number of his units (ten) to be used to measure the extent of fading easily appreciable and important.

The constants we chose may not ultimately prove the the best ones, but, in the present state of our knowledge, I doubt whether a better choice could be made for the specific purpose in question. When dealing with a small range of colors, a different choice of constants cannot make a great deal of difference. One can see this most clearly by noting that the formula corresponds to finding the hypotenuse of a right triangle for the total color change, where the two sides are the lightness and the chromaticity (shade plus brightness). Unless one side preponderates greatly over the other, one usually has to change either side materially before it makes much difference in the hypotenuse.

The third error in the use of the Adams method is one to be much more concerned about in the general case. It is connected with the fact that the *perceptibility* of a fading and its *acceptability* are not necessarily the same or proportional. It is probable that the housewife, hence also the dyer, viewing faded dress goods or drapery, weights change in hue of a given perceptibility more heavily than an equal dulling (certainly, at least, more than an equally perceptible brightening). In the Adams method and some others, it is not easy to adjust the constants to take account of this factor. But, while Figure 8 of my paper shows large hue changes in German standard L-6, most of the standards did not change much in hue, especially the American standards. Incidentally, this is another point of superiority of the latter standards. But more important in the present discussion is the fact that errors from this effect may be much worse in the traditional method of visual judgment than in calculation from instrumental measurements. For at least the same constants may be agreed upon by all workers, and corrections applied readily, while in visual judgments, every individual (and laboratory) has his own criteria for assaying the objective color changes. Work done in the laboratories of Imperial Chemical Industries proves that, even in visually judging strengths of dyeings, different persons vary in the way they weight the objective correlates of lightness and colorimetric purity (which is closely related to saturation, or dyer's brightness). Work of my own tends to substantiate and broaden this conclusion.

We are thus left, in the general case, in a situation with the Adams method at least as good as in the usual visual judgments; and, I think, in a much better situation in the restricted case. When one takes into account also the great variations in the color-vision systems of individuals (see, for example, the work of W D Wright in England), and the large variations even in the "daylights" or north skylights used to illuminate the samples in fastness testing, it is no exaggeration to say that the Adams method and formula, even with known errors, may be much better than the usual methods of visual evaluation.

It must be admitted finally that the spectrophotometer does not "see" exactly what the human eye sees, because of different conditions of illumination and viewing the samples. But the differences cannot be very great for comparisons of similar materials in a small range of colors; surely not of the very great magnitudes of those with which we are concerned here. As to errors in the process of fading, I cannot of course speak, for our work was limited to measuring differences in the already exposed standards delivered to me, as Secretary of the AATCC Color Committee.

2. It is not clear what is meant by the statement that the American "criterion of fading is also different." However, I have just pointed out that even within a given laboratory (as Dr Vickerstaff says) the criteria of fading varies. Of this fact I can furnish ample objective proof, if the published ICI experience is not enough. Indeed, a colleague here has recent proof

that even a given observer changes his criteria from time to time in the very closely related problem of judging deviations from match. But in any case it is difficult to see how this could account for maximum variations in the American standards of 300 to 350%, as compared with the 1000 or 2000% variations in the British set, or for 5.5 hue steps in American L-6 as compared with 21.5 steps in German L-6 (or 0.0 with 1.0 in sunlight).

3. The points mentioned under heading 3 do not bear very directly on the paper in question. However, for other reasons than those stated it seems wise, if one uses the method of varying the exposure-time to reach a constant magnitude of fading, to resort to *two* appropriately separated amounts of fading or exposure. If one looks at the curves in Vickerstaff's paper for pigment samples of various fastnesses relating degree of fading and exposure time, one sees that no single time ordinate cuts all curves at conveniently spaced magnitudes of fading. The Vickerstaff & Tough paper dealt with pigments; but it is believed that if data, presented in the extensive pioneer work of Cunliffe in England in the early thirties, were modernized, they would mirror Vickerstaff's general picture. It may be suggested that, if we had such curves for a number of dyeings in each of the various conventional classes of fastness, the best criteria for picking the length of time for the two periods of exposure (or the constant degree of fading taken as standard) would be those that preserved the present ratings to the greatest degree. It is of course to be hoped that one of the chosen exposure periods would cover what the British committee calls "a small initial fade in a relatively short exposure," while the other (when necessary) would be the "further and more definite fading." This question will be examined somewhat further below.

4. The present writer does not feel qualified to discuss the larger questions of international standardization except where data concerned with measurement problems are involved. It is presumed that these questions come under the scope of the International Organization for Standardization's Technical Committee 38 on Textiles, and of similar organizations.

5. Point (a), that the British higher-numbered standards are "rather too fast" is confirmed in the Godlove paper insofar as sunlight exposure is concerned. In Fade-Ometer exposures the results are too erratic to draw definite conclusions, except that in any case standard 4 is badly out of line. Perhaps comparison of these two results may be taken to show that Fade-Ometer exposure yields a poor measure of fading if sunlight is the ultimate standard of illumination, as pointed out in the paper. As to the attainment of the British Committee's objective, the phrase "not quite attained" is perhaps a slight understatement; for the data show extreme variations, even in sunlight exposures, of 1000% (0.2 units to 2.0 units).

In item (b) (i), the point is made that standards 1, 2 and 3 do not give the same relative amounts of fading in "standard" and "double" hours, though they do visually. The data on which Figures 2 and 5 were based, however, yield the following ratios (effect of doubled versus standard hours):

In sunlight, British Standard 1, ratio 1.23; Std 2, 1.15; Std 3, 1.82; average 1.40. British in Fade-Ometer, Standard 1, ratio 1.69; Std 2, 1.32; Std 3, 0.85; average 1.29. German Standard 1 in sunlight, 1.31; Std 2, 1.85; Std 3, 1.87; average 1.68. In the Fade-Ometer, Standard 1, 1.59; Std 2, 1.12; Std 3, 1.16; average 1.29. Collecting the averages, we have: British, 1.40 and 1.29; German, 1.68 and 1.29; sunlight, 1.40 and 1.68; and Fade-Ometer, 1.29 and 1.29. The general average of all these ratios is 1.42. The average deviation of the four averages from the general average is 9.5%. This does not appear to be a great variation compared with some of those we have been discussing, and means that the relative behavior of standard and doubled hours was shown to be rather constant; but it will be conceded that some of the individual variations are larger. It may be noted, in connection with item 5 (c), that the British and the German general averages differ by only 6%, contrary to the British Committee's statement. Incidentally also, that the Fade-Ometer average differs from the sunlight average by 16%.

While conceding point (b)(i) as valid in a degree, it may be pointed out that, in view of probable large errors in visual judgments even by experts (proof of which can be given if of value), it is at least possible that the apparent fact of item (b)(i) may not be entirely valid. This point can be investigated.

The fact mentioned in item (b)(ii) will be conceded; and I am grateful to the British Committee for pointing it out. Moreover, other apparent inconsistencies of this nature could also be pointed out. But these facts are just what my paper was intended to find out and show. Further, an analysis of this particular case is very illuminating. The "fading indexes" were single numbers, giving the *composite* fading *in three dimensions* or color attributes. But they are arrived at by combining three numbers. My data show that British L-8 in 160 hours faded greener by approximately 11 Munsell hue steps (equal to more than half the hue-change from red to yellow), while British L-7 in 160 hours changed by about 3 hue steps. The Fading Index for L-8 was greater than that for Y-7 almost wholly because the second of the three factors in the Adams equation was over 12 times as great for L-8 as for L-7, an expression of the hue difference. This bad hue change, which was almost nowhere present in the measurements on the American standards, may be responsible for other apparent inconsistencies in the data. If the British Committee believes that it would serve a useful purpose, I could furnish to them or publish the magnitudes of the individual components of the Fading Indexes, where there is any question similar to the present one.

In item (b)(iii), it is pointed out that German L-4 has the same degree of fading in 12 and 24 hours. This was noted *visually* by both an assistant and me, and by two or three other experienced persons whom we asked to verify our observation. This may therefore have been one of the accidental fluctuations in the sunlight exposure translated to the standards before delivery to us. But there may possibly be some connection with the fact that Standard L-4 was very badly out of line in all the Fade-Ometer exposures, and even some sunlight exposures, though it is difficult at the moment to see any connection. This suggests that some further work be done on the relative fading of British and German Standards 3, 4, and 5.

In item (c), it is stated that British and corresponding German standards 1, 2 and 3 should behave similarly, because due to similar dyes, dyed similarly. Again it seems that the British Committee has fallen a victim to the well-known illusions often present in viewing together lines sloping in various directions, as in viewing my published figures. A much better picture would have been obtained if the Committee had carefully analyzed the data of the fading indexes. It will be proved that the British and German standards 1, 2, and 3 *are shown* in my paper to be more similar among themselves than British and German standards 4 to 8. Also, that there is shown in general more similarity between the British and German standards than between the British and American standards. Further, that this similarity of British to German, as compared with similarity of British to American, is greater for standards 1-3 than for standards 4-8.

First, the average difference between British and corresponding German standards 1-3 was 0.70 units, and between British and German standards 4-8 was 0.28 units. This was for standard number

of hours in sunlight. The paper thus exhibits what the British committee said was true in fact because of similar dyes in British and corresponding German 1-3. Next, we compare the average differences British-German with the average differences British-American, first in sunlight. These average differences are as follows: Brit-Germ, 0.70, and Brit-Amer, 1.48 for standards 1-3, the ratio being 1:2.1. We have Brit-Germ, 0.28 and Brit-Amer, 0.22 for standards 4-8, yielding a ratio of only 1:0.8. This means that the British standards differed almost equally from the German and American in the case of 4-8; but the British-to-German difference was shown in the paper to be over 200% of the British-to-American difference, in the case of standards 1-3.

In the case of doubled hours, the same was shown to be true, but less strikingly so (ratios 3.2 and 2.2). In the Fade-Ometer fadings in standard number of hours the fact is even more strikingly brought out by the data of the paper being questioned. For these the ratio of differences was 8.3 for standards 1-3, compared with 2.2 for standards 4-8. While we may therefore agree that standards 1-3 in British and German sets are not exactly alike in fading in corresponding cases, as might be expected if everyone's work were perfect, the paper clearly showed that in two senses they were *more* alike by far than British and corresponding German standards 4-8. Thus the real facts constituted an argument for the soundness of the method of the paper, rather than a point adverse to its efficacy.

SUMMARY OF POINT-BY-POINT ANSWER

Summarizing some of the foregoing discussion, it may be stated that, while the Adams method is subject to known errors of significant magnitude in the general case, its errors can be of no significance when restricted to a small range (especially a small hue range), as in the measurements on the light-fastness standards. If the errors were appreciable, they paled into insignificance in the light of the large variations revealed in the European standards. The Godlove paper confirms the fact stated by the British Committee that the European higher-numbered standards are "rather too fast". Contrary to the Committee's opinion, the data of the paper show fairly constant relative amounts of fading in the European standards in "standard" and "doubled" exposure times. It was shown that in at least one case where apparent inconsistencies were present in the paper, they were due to the larger hue changes found in the European than in the American standards. Again contrary to the Committee's statement, it was shown that British and corresponding German standards 1-3 behave similarly, as expected from the fact that here similar dyes were dyed similarly; and they were more alike than standards 4-8 and more alike than British and corresponding American standards.

Thus it may be seen that even in some of the minutiae which the British Committee chose to emphasize, the paper in question revealed the stated facts, though in some cases some possible validity in the criticisms may be conceded. What the Committee failed to review in its communication were the main facts brought out: namely, that the extreme variation in the fading magnitudes for the eight standards in standard times in sunlight was 0.20 units in the American set as compared with 1.80 and 1.35 in the European sets. In "doubled" time the indexes were 0.20 as compared with 2.45 and 1.60, with similar differences in the Fade-Ometer results. The superiority of the American set in hue constancy was ignored, and the very great misalignment of the European standards L-4 was not mentioned, except to point out a minor inconsistency in German L-4.

It is of interest here to make some comparisons with visually observed facts which were stated in a letter of July 30, 1949, from Charles A Seibert, present chairman of the AATCC Light-fastness Committee to Wm A Holst, the chairman at that time.

The American standards were said in general to be too fast. The Godlove paper thoroughly confirms this fact (average of 0.18 units compared with 0.91 and 0.71, etc.). Seibert found British 1 and 2 too fugitive in both longer and shorter exposure times, with 7 too fast in longer times and 8 too fast in shorter exposures. These facts were confirmed. He found standard 3 acceptable; this was not confirmed for longer exposures. He found German 1 tnd 2 too fugitive, 3 acceptable, 5 and 6 too fast in shorter exposures and 7 and 8 too fast in both exposure times. All these facts were confirmed.

These confirmations lead to the conclusion that the use of the Hardy-G E Recording Spectrophotometer, the Tristimulus Integrator, and the Adams method of converting the objective measurements to "what the eye sees", is a quite feasible procedure.

GENERAL CONSIDERATIONS OF LIGHT FASTNESS

Turning from specific answers to criticism to the broader problems of light-fastness testing in general, it must first be agreed that the cost of the procedure just summarized, with the instruments used by me, may preclude its general use today. But the time is rapidly approaching when this may not continue to be true. Even at present the cost in time per sample faded, for a large organization, is far less than might be supposed on casual thought. With the instruments used by me, the reflectance curve requires less than three minutes per color, the integrations to give the ICI Tristimulus values X, Y, Z require no additional time, and the calculations involved in the Adams formula can be reduced by graphical methods to perhaps a minute or two per color.

This method may still be not the one to recommend at present for routine work in all laboratories; but in important cases, such as government procurement, study of national standards, in reference examinations in cases of serious disagreement, or in large dye-manufacturing laboratories where a great many fadings are studied each day, the procedure illustrated in Vickerstaff's paper and mine may be entirely feasible. Certainly it is sure to become more and more so as the art of colorimetry develops.

It seems time to query seriously the whole traditional procedure of light-fastness testing. In hearing long recitals of the difficulties, errors and erratic results of testing, discussed at recent committee meetings, the question arose whether the state of this art is much better than it was, say, 15 years ago. It is granted that there has been one major improvement, the introduction of blue standards for visual comparisons; also, some improvement in humidity and voltage control and energy output in fading lamps. But on improving the situation for blue samples, the visual judgments are made more difficult for other shades, as in comparing yellow or red samples with blue standards. But another very serious error has been passed over too lightly.

As is well known, in principle there are two methods of testing light-fastness. The traditional method is to measure the number of hours required to bring about a readily noticeable "fading", called variously the "easily appreciable" fade or the "break", etc. The opposite method is to measure visually or objectively the magnitude of the "fading" produced in a chosen standard number of hours. In either method it is possible to remove some disadvantages and objections by taking data for a second magnitude of fading or number of hours.

Many excellent points were made by the authors in the Vickerstaff-Tough paper or in its discussion; and I find myself nearly in agreement on all points but one. If I correctly understand the authors, they regard the first (traditional) method as "the better". I might even agree to this, if we were limited to the instruments

available in most laboratories today, not to those available to me for my April, 1950, paper. Leaving first costs out of question, but balancing accuracy and precision against the time required to attain them, I do not believe that it can be shown that the second method is the poorer one; or at worst that it will long remain so.

The fundamental reason for making this claim is the existence of an error in the traditional method which is too often passed over too lightly. It is almost universally agreed that every individual and laboratory has a criterion of the "break" which is very individual and may not agree with that of others with whom there must be dealings. The complex nature of this variation, especially complex when a change of hue enters into the fading, makes it difficult at times for an individual to agree even with his own previous determinations, and leads to a very bad situation. But this will be passed up at the moment, and attention will be directed to the simpler case where it may be supposed that there is a mere loss of strength or concentration (sometimes called "on-tone" fading). Even here a change of hue may occur, especially in certain hue ranges. But let us limit ourselves to the still simpler case where the concentration of dye decreases in such a way that the fading includes no hue change at all, corresponding to a restricted definition of "on-tone" fading. It is then necessary to judge only the loss of concentration (?) or magnitude of the fading.

Vickerstaff has correctly pointed out that judgment of the dye concentration may lead to serious errors. For fading is in most cases largely a surface phenomenon; and a 50% loss of dye at the surface does not mean a 50% loss of dye which has penetrated within the fiber. Variable penetration is too great a difficulty to make this procedure feasible.

We are left then with a judgment of magnitude of visual change, either directly or by conversion from some instrumental data. It has been my observation that even highly experienced observers cannot agree too well on such judgments of vital magnitude. This is true under *best* observing conditions. Under such good conditions, a colleague obtained data on independent repeated judgments of small color differences by very expert observers; and the results leave very much to be desired. This was for the *best* observing conditions.

But, as a matter of fact, the usual judgments in light-fastness tests are made under rather poor observing conditions (a small area, a rather diffuse instead of a sharp dividing line of demarkation between "faded" and original sample, differences of texture, etc.). Admittedly, the situation is much better with standards of the same hue present than without them, though worse with sample and standard of different hue.

While single individuals vary considerably in their judgments of magnitude and nature of fading or color differences, because of different criteria and because of real and large differences in their amounts of yellow-brown retinal pigment, it is possible to obtain data, in careful research work, which represent the responses of an average or standard observer and which are statistically valid. Such average data can be combined with highly precise objective measurements with some instrument, as was done in my paper, to yield accurate measures of fading, within the limitations already discussed.

If one wished to undertake anew the setting up of a series of eight or less light-fastness standards, information is already at hand for following up suggestions contained in the work of Cunliffe and Vickerstaff and of the American Committee, combined with procedures I have used in this and other problems, to obtain improved standards.

Let us refer to Vickerstaff's curves relating time of exposure to degree of fading for 7 pigments, which, for the moment, may be taken to represent 5 to 8 light-fastness standards. It is found that no one ordinate for a single chosen exposure time cuts all the fading-course curves at points corresponding to convenient magnitudes of fading. However, two exposure time ordinates can probably be chosen which together will cut all fading curves at some convenient and practicable fading magnitude. Where certain curves for dyes of intermediate fastness are cut by both chosen ordinates, the fading magnitudes for both time ordinates can be chosen so as to be consistent, that is, to give approximately the same ratings.

It may turn out that the degrees of fading required to produce the standard fastness classes may be different in the case of reds from those for blues of the same fastness rating, but in a practical sense that would be of no great disadvantage, for we are completely at liberty to make the amount of fading whatever we wish for each of the fastness classes. Such a procedure would have a number of practical advantages. It would avoid the trouble of putting samples in and out of the fading lamp until the "break" is reached, and the known errors of intermittent fading compared with continuous fading (due to partial recovery, moisture changes, etc.). It would avoid the necessity of the alternative of making fadings for several different exposure times, thus crowding available space in the fading lamps. The chief criterion for establishment of the degrees of fading for each class would be that the class ratings should remain as near as possible what they are today.

If such a procedure proves to be practicable, it would make the measurements all objective and referring to a standard average eye, that is, not subject to the varying individual criteria and physiological idiosyncrasies of particular observers. It is realized that the procedure outlined is a somewhat hypothetical one; but facilities are available in this laboratory for rapidly determining how practicable the suggested method may be. It is realized that some dyestuffs will present complications, but these complexities would be met in any method of light-fastness testing. Uncertainties would be met in applications of the Adams equation, or substitutes for it; but this is a problem readily amenable to study and adjustments on an empirical basis.

Finally, I wish to make it clear that I am answering the British Committee's communication wholly as an individual, not as a member of any of the several committees on which I serve which have to do with color-measuring problems, nor as representing the corporation which employs me.

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EMPLOYMENT REGISTER

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50-51

Education: Textile Institute of Enschede, Holland, with employee training in Switzerland and Bradford, England.
Experience: Eleven years management of dyehouse and bleachery operations, covering cotton, wool and synthetic fibers.
Age 33: married, position in U S A desired.
2-19, 3-5

Wool Group—

MOTHPROOFING—DETERGENT COMBINATIONS*

H C BORGHETTY, W N PARDEY and O L SHERBURNE

General Dyestuff Corporation

This paper covers various types of mothproofing agents and indicates that the loss of some of the wool-fabrics market to synthetic fibers could be avoided to some extent by the use of mothproofing agents. A new approach to the problem is offered by combining a substantive cation-active mothproofing agent with nonionic synthetic detergents to give combinations that serve simultaneously as mothproofing agents and washing agents. This new development can be applied either in textile mills or in the household because of the low temperature at which the system can be made to function. Fabrics washed with specially prepared quaternary mothproofing agents plus ethylene oxide condensates can be stored indefinitely without danger from moths and carpet beetles.

INTRODUCTION

WOOL represents the third most important textile fiber, and in recent years total consumption has followed a gradual uptrend relative to population figures and industrial activity. Simultaneously, however, it has shown a percentage downtrend in relation to the consumption of all textile fibers. One of the reasons for this downtrend is that the wool fiber has two inherent drawbacks: it shrinks and it is eaten by moths. Wool has the inherent property of felting, which is important in the finishing of wool fabrics and yet which causes wool materials to shrink so rapidly in washing that they soon become unserviceable. The use of shrinkproofing agents based upon chlorine and resins are becoming more popular and may help to counter this drawback. The second and equally important drawback, that wool is a food for moths, and also carpet beetles, leads to ravages, which also render wool articles unserviceable. This results in an economic waste, calculated to be approximately two hundred million dollars per year.

The wool industry in some cases feels that greater moth destruction results in greater demand for wool articles; therefore application of mothproofing agents has not been given the priority it deserves. This is a false basis of approach; a durable mothproofed wool would eliminate the hidden economic and energy waste to which the housewife is subjected to avoid moth damages.

TYPES OF MOTHPROOFING AGENTS—The keen interest of the consuming public in combating moths and carpet beetles with make-shift remedies indicates the desire to overcome a deficiency for which the wool industry could assume responsibility. For many years there have been available various types of mothproofing agents, which can be divided into five main categories:

1) *Naphthalene, paradichlorobenzene,* etc, in various forms of flakes and moth balls, which are used to store blankets both prior to sale and in the household. They are effective only in sealed containers and when used abundantly.

2) *Water-soluble, low-cost silicofluoride products,* which can be readily applied by spraying. These give excellent protection to dry cleaning but no fastness to washing. They are satisfactory for use in textile mills and the home for articles that are not intended for washable purposes.

3) *Moth repellents applicable in dry-cleaning solvents* such as DDT and the chlorinated aromatic sulfonic types, which are soluble in dry-cleaning solvents and are therefore applicable directly with the dry-cleaning fluid. A new approach to the problem of dry cleaning is today based upon the fact that the solvents used require the addition of small quantities of water for effective cleansing action. This permits the use of water-soluble materials, which are then carried by the water to the fabric even though they are not soluble in the solvent.

4) *Durable moth repellents, such as pentachlorodihydroxytriphenylmethanesulfonate,* which is a colorless substance similar to an acid dye in behavior toward wool. It is applicable to wool only in the mill during the dyeing process. It has a fastness on wool equal to ordinary requirements for washing and dry cleaning during the usual life of wool garments. Another type in this category is tetrachlorodiphenylether of phenolureasulfonate.

5) *Reverse-charge basic-dye type mothproof repellents,* such as 3,4-dichlorobenzyltriphenylphosphonium chloride, $[Ph_3PCH_2PhCl_2]Cl$. This chemical can be applied from a neutral bath after dyeing or after fulling, or as an aftertreatment for garments in the household, to give mothrepellent effects, which are fast to dry cleaning. This product is actually a phosphonium chloride complex similar in behavior to the well-known quaternary ammonium complexes, which have become so popular in the finishing of cellulosic fibers. The writers now propose that utilization of this product be made in conjunction with nonionic detergents of the ethylene oxide type, such as $C_8H_{17}Ph\ O(C_2H_4O)_9H$, monoiso-octylphenylether of polyethyleneglycol, to give mothproofing effects simultaneously with cleansing.

The affinity of the phosphonium complex for wool fiber is much greater than the affinity of ordinary cationic complexes for cellulose because the acidic groups in the wool have great attraction for the reverse-charge phosphonium molecules.

The four aromatic groups in the phosphonium chloride complex act also like a colorless dyestuff and are absorbed very readily even at low temperatures. The fastness to washing of this product with soap is not fully satisfactory; the anionic soap reacts with the phosphonium ion to form a complex, which can be removed from the fiber by an excess of soap.

MOTHPROOFING-DETERGENT COMBINATIONS

In the development of the practical application of the theory above outlined for mothproofing-detergent combinations, it was necessary to find out if the cationic moth repellent interferes with the cleansing action of the detergent.

In our previous experience with quaternary ammonium types of materials, which have found application in the dairy industry as germicidal detergents in the presence of nonionic agents, it was found that the cation-active material, while it exhausts on the cellulosic fiber, carries back to the fiber a great deal of

*Presented by H C Borghetty at the Twenty-ninth Annual Meeting in Portsmouth, N H, on September 29, 1950.

soil. It is for this reason that cationic detergents are not satisfactory scouring agents for cellulosic textile materials. The detergent properties of quaternary ammonium-nonionic combinations are satisfactory only in the cleansing of smooth metallic or chinaware surfaces. In the investigation concerning the mothproofing type on wool, however, it was found that a nonionic detergent would maintain an emulsion and suspension of the dirt in the fiber, provided the mothproofing material did not have an emulsifying effect on these soils. It was therefore necessary to select a mothproofing agent other than the usual quaternary ammoniumum type. It was fortunate, therefore, that phosphonium chloride had the requisite affinity, solubility, yet low emulsifying properties. A quaternary ammonium type, such as the alkyldimethylbenzylammonium chloride possessing a long aliphatic chain derived from coconut oil, imparts bactericidal qualities and also considerable surface-active properties to the molecule *(1)*. Its retention by the wool fiber is also considerably lower.

During the practical application of the mothproofing-detergent combination, we have found the following formula to give a mothproofing detergent solution, which is clear and stable because of the absence of any disturbing impurities:

6 parts active ingredient:
3,4-dichlorobenzyltriphenylphosphonium chloride
dissolved in
34 parts monoiso-octylphenylether of polyethylene glycol
60 parts water

It was found necessary to use salt-free phosphonium complexes to achieve good results.

APPLICATION

IN THE MILL—This formula can be run on dyed fabrics or immediately after fulling and rinsing, in liquor ratios of 1:20, for a period of 20 minutes at a temperature varying from 90 to 120° F to give excellent exhaustion of the mothprotective agent on the wool material. The degree of exhaustion of the phosphonium complex on wool under such conditions was found to be about 70% as determined by the amount remaining in the bath as evaluated with the testing papers currently offered for the detection of cation-active agents in solution.

Our extensive tests have established the effect of various concentrations and temperatures on the mothproofing detergent. For application in a liquor ratio of 1:20, we use 1 ounce of the above stock solution per gallon of wash liquor. For liquor ratios other than 1:20 the amount of phosphonium compound necessary is 1% calculated on the weight of the fiber for an assumed retention of 0.7%. The detergent properties of the combination on fulled goods that have been rinsed are satisfactory.

IN THE HOUSEHOLD—The detergent properties for household use are more important than during practical mill application. The housewife finds that articles washed in the above combination of 6 parts phosphonium compound receive complete cleansing simultaneously with moth resistance. A further advantage of the combination is elimination of the use of soap and therefore any danger of impairment of the activity of the reverse-charge mothproofing agent. Articles washed indefinitely in this combination can be stored from season to season without danger from moths and carpet beetles.

The writers present below the results of the investigation on which the formulations above are based. The concentrations reported are the optimum found to give protection. The liquor ratio of 1:30 is an average of what can be expected and shows that the phosphonium product exhausts well.

Three fabrics were chosen: (a) challis (b) broadcloth, and (c) serge. These fabrics were treated in three ways:

1) By exhaustion for 30 minutes at 100° F from a bath containing 1% of quaternary phosphonium compound (Eulan NK Extra Conc) on the weight of the fabric in a liquor ratio of 1:30. This represents a nonpermanent type of moth-resistant finish.

2) By exhaustion for 30 minutes at 100° F from a bath containing 1% quaternary phosphonium compound (Eulan NK Extra Conc) on the weight of the fabric plus 1.3% nonionic detergent (Igepal CA Extra), also on the weight of the fabric in a liquor ratio of 1:30. This treatment is satisfactory for use by the housewife.

3) By exhaustion for 40 minutes at 180° F from a bath containing 2% of pentachlorodihydroxytriphenylmethanesulfonate, (Eulan CN), 3% sulfuric acid, 66° Bé and 5% Glauber's salt (all concentrations based on the weight of the fabric) in a liquor ratio of 1:30. This represents a permanent-type moth-resistant treatment, which is considered as standard for all durable moth-resistant treatments.

Samples of the fabrics with the various moth-resistant treatments as well as an untreated sample were next washed in both a neutral soap and in a nonionic detergent. Wash tests were carried out in a Launder-Ometer. Each sample was washed individually in a 0.5% neutral soap solution for 5 minutes at 90° F and then rinsed. Other swatches were washed in the same manner with a nonionic detergent in place of soap. A third set was dry-cleaned in the Launder-Ometer at room temperature with Stoddard solvent plus the addition of a standard dry-cleaning soap.

Washes and dry cleanings were repeated several times so that insect tests could be carried out on the following samples: the original, after 1, 5, 10, 15, and 20 repeated soap washes, after 1, 5, 10, 15 and 20 repeated washes with a nonionic detergent as well as after 1, 5, 10, 15, and 20 repeated dry cleanings.

In laboratory tests it is not considered sufficient to repel or kill small, newly hatched larvae; therefore the fabrics were subjected to a much more severe test.

Circles with an area of approximately 2 square inches were cut from each fabric, both treated, and washed. These were placed in containers of such a size that the larvae were not free to move away from the test piece but had to survive or die, eat or starve on the protected or unprotected piece in question. Ten larvae of black carpet beetles were placed on each test sample where they were kept for 28 days at 80 ± 5° F and 60 ± 5% relative humidity, the ideal condition for insect activity. The larvae as used in testing must be 5 months old in the case of the black carpet beetle and from 25 to 27 days old for webbing clothes moths. These larvae have been raised under ideal conditions and are at the height of their eating ability. Home conditions would not expose woolens to rigid rules of size and age of pests nor to ideal conditions of temperature and humidity. The chief hazard would be from the tiny newly hatched larvae; therefore any protection that withstands a laboratory test of this kind can be expected to give full protection under ordinary circumstances.

The AATCC recognizes two methods of evaluating results of tests for moth resistance. After many trials the results of either method have been found, for all practical purposes, to be interchangeable with the results of the other.

In the so-called "Fabric-Loss Method" the sample is weighed both before and after incubation. The loss of weight, after exposure to the larvae, indicates its resistance.

The other method, "Excrement Weight," which was used in our tests, is based on the amount of excrement deposited by the larvae during the 28-day incubation period.

After the 28-day incubation period the larvae are removed, the sample freed of excrement, cast skins, etc. The excrement is now sifted to remove the cast skins, clipped fibers, etc, and is weighed in milligrams.

A treated sample showing adequate re-

TABLE I

Treatment	Wash or Cleaning Test	Number of Tests	Milligrams Excrement			Percent Retained Protection Based on Untreated		
			Serge	Broadcloth	Challis	Serge	Broadcloth	Challis
1% Eulan NK Extra Conc owf Exhausted for 30 min at 100°F 1:30 liquor ratio	AATCC Wash Evaluation (5 min at 90°F)	none	4.0	4.5	11.4	84	82	59
		1	3.6	5.1	8.2	86	80	70
		5	8.1	6.8	25.1	68	73	10
		10	8.2	8.4	37.0	67	67	0
		15	20.8	13.2	38.4	17	48	0
		20	30.3	19.4	43.4	0	23	0
	Igepal CA Extra Wash (5 min at 90°F)	1	4.4	6.8	10.5	82	73	62
		5	6.4	5.5	16.0	74	78	43
		10	6.6	5.6	21.0	73	78	25
		15	5.0	5.3	21.7	80	79	22
		20	7.5	5.8	21.5	70	77	23
	AATCC Dry-Cleaning Evaluation	1	6.1	6.5	19.2	75	74	31
		5	7.3	5.5	16.2	70	78	42
		10	6.3	5.3	9.2	74	79	67
		15	6.0	3.7	6.9	76	85	75
		20	5.3	6.7	11.0	78	73	60
1.3% Igepal CA Extra owf 1% Eulan NK Extra Conc owf Exhausted for 30 min at 100°F 1:30 liquor ratio	AATCC Wash Evaluation (5 min at 90°F)	none	2.8	3.5	4.1	88	85	85
		1	4.0	4.9	11.8	84	81	57
		5	7.1	6.1	25.2	72	75	9
		10	11.2	8.2	25.8	55	67	7
		15	16.0	16.4	29.7	36	35	0
		20	32.6	24.2	40.1	0	0	0
	Igepal CA Extra Wash (5 min at 90°F)	1	2.0	6.0	11.1	81	76	60
		5	6.2	5.0	8.5	75	80	69
		10	5.0	6.6	11.3	80	74	59
		15	5.6	5.3	10.0	77	79	64
		20	6.3	5.7	8.3	75	77	70
	AATCC Dry Cleaning Evaluation	1	6.2	4.6	6.1	75	71	78
		5	5.0	7.3	7.6	80	82	73
		10	6.8	5.4	8.6	73	71	69
		15	5.6	5.2	8.9	78	79	68
		20	6.3	5.4	13.6	75	77	51
2% Eulan CN 3% Sulfuric Acid 5% Glauber's Salt all owf Exhausted for 40 min at 180°F 1:30 liquor ratio	AATCC Wash Evaluation (5 min at 90°F)	none	4.0	3.9	2.3	84	84	92
		1	3.2	5.9	3.6	87	77	83
		5	3.5	4.4	2.7	86	83	90
		10	3.7	4.3	3.2	85	83	88
		15	4.0	4.4	4.1	84	83	85
		20	4.1	5.0	5.5	84	80	81
	Igepal CA Extra Wash (5 min at 90°F)	1	2.3	3.7	3.8	91	85	86
		5	2.3	2.9	3.7	91	89	87
		10	2.4	3.7	3.5	90	85	87
		15	2.8	3.8	2.2	89	85	92
		20	2.3	3.3	2.6	91	87	91
	AATCC Dry Cleaning Evaluation	1	5.6	3.7	1.5	78	85	95
		5	2.6	3.4	3.3	90	86	88
		10	3.9	3.6	2.1	84	86	92
		15	3.2	3.7	2.7	87	85	90
		20	4.2	3.5	2.5	83	86	91
Untreated			25.0	25.3	27.9			
	AATCC Wash Evaluation (5 min at 90°F)	1	42.0	49.2	43.9			
		5	46.1	50.4	52.4			
		10	47.4	54.5	53.2			
		15	48.3	37.3	52.5			
		20	46.8	53.0	55.5			
	Igepal CA Extra Wash (5 min at 90°F)	1	18.9	23.9	33.1			
		5	17.0	26.8	37.0			
		10	19.8	34.4	40.0			
		15	20.9	38.0	33.5			
		20	20.6	39.9	41.0			
	AATCC Dry Cleaning Evaluation	1	48.4	30.6	18.2			
		5	21.8	20.0	43.8			
		10	47.2	43.4	30.4			
		15	46.2	29.1	35.0			
		20	48.9	35.4	28.4			

sistance to insect pests is assumed to give an excrement weight of 6 milligrams or under when an untreated sample of the same fabric shows an excrement weight of at least 25 milligrams, or, to put it another way, a treated sample which shows 75% protection over an untreated sample of the same fabric is considered sufficiently resistant to insect pests.

Table I shows the results of our tests in milligrams excrement. In the three righthand columns these are calculated into percent retained protection according to the method explained in the *AATCC Technical Manual and Year Book*.

On studying these figures it is to be seen that all three types of fabric, light, medium, and heavy are sufficiently resistant in the original, after repeated washings in soap, nonionic detergent and dry cleanings when properly treated with the standard permanent-type moth-resistant product, Eulan CN.

The phosphonium quaternary compound gives sufficient resistance to medium and heavy fabrics, withstands limited soap and water washes and, when laundered with nonionic detergents, indefinitely retains its protection after repeated laundering and dry cleaning. In the case of the challis a certain amount of protection is added over the untreated piece but not sufficient to be considered resistant.

When a nonionic detergent is combined with a quaternary compound in the original treatment, the resistance is improved to include the unwashed sheer challis, and again the resistance is retained after repeated washings in a nonionic detergent, as well as after repeated dry cleanings.

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Synthetics Group:—

NYLON DYEING—THEORY AND PRACTICE*

DR G T DOUGLAS

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The theory of the dyeing of nylon is presented in a relatively simplified form, and the part that the chemical groupings in nylon play in dyestuff uptake is discussed. The dyeing behavior of nylon is compared and contrasted with that of wool. The value and limitations of the various dyestuff ranges for nylon are outlined, and some of the difficulties that are met in practice in the dyeing of this fiber are dealt with. A chrome dyeing technique developed as a result of the fundamental researches into the dyeing mechanism of water-soluble dyestuffs on nylon is given, and also the dyeing behavior of vat and azoic dyestuffs is discussed. Finally, the problems involved in the coloration of wool/nylon union materials are stated and recommendations are presented for the dyeing techniques to be employed.

INTRODUCTION

FROM the technological viewpoint the dyeing of nylon has been investigated fairly fully, and papers by White *(1)* and Stott *(2)* described some of the early work on the dyeing of this fiber. Because Vickerstaff *(3)*, Peters *(4)* and Boulton *(5)* have all presented experimental evidence from fundamental research work on the dyeing of nylon with various classes of dyestuffs, the color chemist and the physicist today have a reasonably clear picture of the mechanism governing the dyeing of nylon. This, however, is only true, provided they do not delve too deeply into the mechanism of dyeing and accept broad principles only. It is proposed in this talk to deal with these broad principles so that the theory of nylon dyeing can be presented in a relatively simplified form and at the same time so that it can be shown how these principles fit in with practical dyeing procedure.

CHEMISTRY OF NYLON AND WOOL

Nylon 66 is produced by condensation of hexamethylenediamine with adipic acid. To control the chain length of the polymer, a small addition of acetic acid is made, which reacts with a proportion of the amino end groups and stops further polymerization. Thus, in nylon, the following chemical groupings occur:

—CO—NH—
—COOH
—NH_2 and
—NH.$CO.CH_3$

It is well known that, in many respects, the dyeing behavior of nylon is similar to that of wool. The main chemical groupings in wool that take part in the dyeing mechanisms are the following:

—CO—NH
—COOH
—NH_2 and
—S—S—

It will be seen that three groupings are common to both wool and nylon, but the proportions in which these groups are present, as Table I shows, are not the same for both fibers. These, along with the presence of the disulphide bonds in wool, are responsible for differences in dyeing behavior between the two fibers when taken in conjunction with the hydrophilic nature of wool and the hydrophobic properties of nylon. In both wool and nylon there is a complete sufficiency of amide groups, if these can be utilized as dyeing sites.

This table will be referred to as the various classes of dyestuffs are discussed.

DISPERSED ACETATE-RAYON DYESTUFFS ——— Dispersed acetate-rayon dyestuffs are absorbed into nylon fiber from a fine aqueous dispersion of the dyestuff, and dyeing behavior closely resembles that on acetate rayon. The chemical grouping that is responsible for the attachment of these dyes in the nylon fiber is the amide group, and it is postulated that hydrogen bonding is the mechanism. Provided the molecular weight, structure and fineness of dispersion of the dyestuff are such that penetration into the fiber structure is possible, dyeing takes place. A compromise must be made on molecular size of the dyestuffs. Small, compact dye molecules penetrate readily, yielding excellent leveling, good temperature range but low wet fastness. With increasing molecular size, slower penetration, poorer leveling and temperature range but higher wet fastness are realized. The dispersed acetate-rayon dyestuffs only show up physical irregularities in the nylon fibers, such as denier differences, variations in orientation and crystallinity, and they cover all chemical differences as the amide groups are present in abundance.

TABLE I

Grouping	Nylon	Wool	
—NH—CO—	Ample	Ample	
—NH_2	0.035	0.80	milliequivalents per gram
—COOH	0.09	0.80	milliequivalents per gram
—S—S—	Absent	Present	
—NH—$CO.CH_3$	Present	Absent	

* Presented before the Twenty-ninth Annual Convention in Portsmouth, N H, on Sept 30, 1950.

TABLE II

	Percentage "Solubility" in	
	Nylon	Acetate Rayon
Dispersol Fast Yellow A 300 Powder Fine	5.0	16.0
Dispersol Fast Scarlet B 150 Powder Fine	3.9	8.3
Duranol Red X3B 300 Powder Fine	7.6	12.2
Duranol Brilliant Violet B 300 Powder Fine	24.9	58.8
Duranol Brilliant Blue BN 300 Powder Fine	11.8	23.8
Dispersol Diazo Black A 300 Powder Fine	2.3	5.6

The building-up properties are limited, but not seriously, however, from a practical viewpoint. It seems that only in the amorphous regions of the fiber are the amide groupings capable of being "got at" by the dispersed acetate-rayon dyestuffs. A comparison with acetate rayon indicates that there appears to be a higher proportion of crystalline regions in nylon than in acetate rayon. This is supported by the fact that the "solubility" of dispersed acetate-rayon dyestuffs in nylon is lower than on acetate rayon when dyeing is conducted to equilibrium. A few typical examples are given in Table II.

In practice, for example, it would be futile to attempt to produce a 4% shade of Dispersol Diazo Black A 300 Powder Fine on nylon, but this would be readily achieved on acetate rayon.

Dispersed acetate-rayon dyestuffs, in view of their excellent leveling properties, compatibility in admixture and their ability to cover yarn irregularities, will continue to be the most popular class of dyestuffs for nylon.

SOLUBLE ACETATE-RAYON DYESTUFFS——A study of the water-soluble Solacet dyestuffs showed that their dyeing behavior on nylon differed markedly from that on acetate rayon. On nylon they failed to show salt-controlled exhaustion and marked sensitivity to liquor-to-goods ratio. It was soon observed that, in controlling exhaustion of the Solacets on nylon, the place of salt could be taken by acid, which increased both the rate of dyeing and the equilibrium exhaustion, the latter being attained in normal dyeing periods. The Solacets, when applied to nylon, did not show the high degree of sensitivity to variations of liquor-to-goods ratio, and it was soon discovered that on this fiber the Solacets dyed in a manner similar to that of the monosulfonated acid dyestuffs. Later mention will be made of this class of dyestuffs in the discussion of acid dyes.

ACID DYESTUFFS —— Peters *(4)* attempted to clarify the behavior of acid dyestuffs on nylon and showed that the quantity of acid dye that was absorbed into nylon was related to the number of amino end groupings (—NH_2) over the practical range of pH values. When nylon is contained in an ionizing solution, the end amino groups and the carboxylic acid groups in the nylon become

$$-OOC—(NYLON\ CHAIN).NH_3^+$$

If an acid is present, the ionization of the carboxylic acid grouping is suppressed, and when an inorganic acid, such as hydrochloric acid, is employed a Cl^- anion is absorbed to preserve electrical neutrality. If an acid dyestuff is also present in the solution, the dyestuff anion, because of its greater intrinsic affinity, displaces the Cl^- and the position reached is

$$HOOC.(NYLON\ CHAIN).NH_3D$$

the dyed fiber, where the negatively charged dye anion neutralizes the positively charged ammonium group to give what is known as a salt linkage.

Peters showed that the amine-end content of nylon is 0.035 milliequivalents per gram, and when these amino groups are saturated, no further uptake of level-dyeing acid dyestuffs is possible without lowering the pH of the dyebath to below pH 3 into the range beyond practical expediency. At dyebath pH values below 3, where degradation of nylon is apparent, much greater dye uptake is evident, and the dye absorbed represents a much greater amount than would be theoretically necessary to saturate all the amino groups of the nylon. Here Peters suggested that the amide groupings in the nylon become positively charged from the high concentration of hydrogen ions in the solution, and, to preserve electrical neutrality, dye anions are absorbed near to the positively charged amide groupings. Because of the degradation suffered by nylon in dyebaths of very low pH, this high absorptive power cannot be utilized in practical dyeing.

As is well known, acid dyestuffs vary in their degree of sulfonation, and, with a salt linkage mechanism of dyeing, it is obvious that on every six available amino groupings present in nylon, 6 molecules of a monosulfonated dyestuff, 3 molecules of a disulfonated dyestuff or 2 molecules of a trisulfonated dyestuff can react in acid solution. Therefore, with the assumption of tinctorial equivalence of dyestuff anions, monosulfonated acid dyes will build up more than disulfonated types, which in turn will build up to deeper shades than trisulfonated types.

As the rate of diffusion of a dyestuff is dependent on the surface concentration of the dyestuff on the fiber, monosulfonated dyes will, in general, migrate and diffuse comparatively more rapidly into the fiber than disulfonated dyes and the latter type more readily than a trisulfonated dyestuff. Mixtures of mono-, di- and tribasic dyestuffs will thus lead to difficulties in practical dyeing. To exemplify this, Lissamine Red 7BPS (0.5% shade) when dyed on nylon has a time of half dyeing of 2 minutes and Tartrazine NS (0.5% shade) of 1 minute. When both these dyestuffs are applied simultaneously to nylon in 0.5% shades, the Lissamine Red 7BPS, a dibasic dyestuff, has a time of half dyeing of 3.25 minutes and Tartrazine NS, a tribasic dyestuff, an 11.25-minute period. The rates of dyeing are therefore reversed. Furthermore, the more complex the dye anion, the greater will be its affinity, and the acid-milling dyes, because of their higher affinity, will inhibit the dyeing of the simpler level-dyeing types.

In practical dyeing, therefore, monobasic acid dyestuffs are preferred to the dibasic type, which are in turn superior to the more highly sulfonated dyestuffs in that higher color value is realized and maximum use of the rather limited number of amine end groups in nylon is made. Greater penetration and superior temperature-range properties are also realized if this preference is adhered to, and dyestuffs of the same type should, where possible, be employed in mixture shades, both from a dyeing and fastness viewpoint.

However, acid dyestuffs show up differences in amino end content of nylon fibers, and here they are inferior to the dispersed acetate-rayon dyestuffs. For the covering of irregular-quality nylon, monobasic dyestuffs are to be preferred to di-, and di- to tribasic acid dyestuffs as with lower basicity somewhat greater leveling power is obtained. Moreover, acid dyestuffs that possess high neutral affinity are better suited for the covering of irregular nylon than acid-dyeing types. In the dyeing of nylon near pH 7, there appears to be involved a dyeing behavior that is more than or rather, additional to, the simple salt linkage mechanism. The dye anion attaches itself not only to the ammonium group by salt linkage but also to the amide groups by hydrogen bonding as follows:

$$NaOOC.(NYLON—CO—NH—CHAIN)—NH_2D$$

$$D \quad H^+ \text{ or } Na^+$$

With a portion of the dyestuff being attached to a grouping in ample supply in the nylon molecule, differences in dyeing behavior due to amine end-content are minimized. This additional mechanism for the attachment of dyestuff to the nylon and the molecule is probably best illustrated by the Solacet dyestuffs and a few selected milling acid dyestuffs. These all possess a high intrinsic affinity for nylon, and the quantity absorbed by nylon is greater than would be accounted for by the amino end groups alone. The level-dyeing acid types, however, always show a good correlation between dyestuff absorbed and amine dyeing sites with dyebath acidities down to pH 3.

All the dyers are familiar with the difficulty of matching deep wool shades on cellulosic fibers, and nylon also presents a similar problem. As wool according to Table I contains 20 times as many amine groups as nylon, it is possible to build up much greater depths of shade on wool than on nylon since the salt-linkage mechanism of dyeing with acid dyestuffs is similar on both fibers. For this reason incompatible mixtures are much less frequent on wool than on nylon, and saturation is rarely reached on wool before the desired depth of shade has been obtained.

GAS-FUME FADING ——— Here a word might be said on the absence of gas-fume fading on nylon. Gas-fume fading on acetate rayon is much more easily apparent in pale shades than in heavy shades. If nylon has been dyed with dispersed acetate-rayon dyestuffs or to pale-shade depths with Solacet or acid dyestuffs, the free amino groupings in the nylon protect the dyestuff against gas fumes. As fading of this type always takes place in acid conditions, it can be readily seen that the amine end groups are most reactive under the conditions necessary for fading. Likewise, dyed wool does not give rise to gas-fume fading troubles. In full shades when acid or Solacet dyestuffs may saturate the available amine end groups, gas-fume fading may occur, but the high concentration of dyestuff on the fiber does not make it readily perceptible. Gas-fume fading, although ultimately theoretically possible, is not likely to be encountered in normal storage or usage of nylon materials.

CHROME DYESTUFFS———A study of the application of chrome dyestuffs to nylon *(6)* made it soon evident that chrome dyestuffs are difficult to chrome by normal wool techniques.

Analysis of the problem suggested that the difficulties arise because

(a) the absorptive capacity of nylon for dichromate ions is much less than that of wool;

(b) in contrast to wool, the nylon, possessing no disulfide bonds, is incapable of reducing dichrome anions to chromic cations, which are required for chelation with the dyestuff;

(c) chroming with chromic salts, such as chromic sulfate or fluoride, is impracticable, because nylon does not readily absorb metallic cations.

The uptake of the dichromate ion is limited by the amine end content of the nylon and is approximately 1/20th of that obtained on wool *(7)* (see Table I). However, sufficient is absorbed to complete metalization of most dyestuffs. In keratin, the disulfide bonds, which in alkaline scouring treatments partially hydrolyze to give sulfinic acid and thio-alcohol groupings, are potential reducing groups and are capable of effecting reduction of the dichromate anions to the tervalent chromic cations. This grouping is absent from nylon, and, in fact, as nylon possesses no similar reducing chemical group, this absence is the principal difficulty in applying chrome dyes to nylon. This has been overcome by the simple expedient of introducing a reducing treatment after the chroming stage. Not only does it ensure maximum metalization of the dyestuff within the nylon, but it also removes residual dichromate, which is not readily removed by washing treatments. The preferred reducing agent is sodium thiosulfate, which is added to the chroming bath after the normal period of chroming. In 20-30 minutes the reduction of the dichromate within the nylon is complete, and maximum metalization is realized.

There is, however, a complicating factor, as a high proportion of the amine end groupings in the case of full shades is occupied by the dyestuff before chroming begins. It has been shown that the mechanism for absorption of dichromate differs from that on undyed nylon. During chroming, some of the dichromate is reduced either by the formic acid in the fiber or by the dyestuffs, and chelation results. When amine groups are thus liberated for further absorption of dichromate anions, full chelation can ultimately be effected in heavy shades.

It will be noted that reference has only been made to the after-chrome process. If one considers the chromate process, it will be seen that competition occurs between the dyestuff anions and the dichromate ions for the available amine sites. Because of the greater intrinsic affinity for the dyestuff and the low affinity for nylon of dichromate anions under neutral conditions, the mordant is excluded almost completely from the fiber. A subsequent reduction process fails even to give any appreciable metalization of chrome dyestuffs applied by the chromate technique.

As far as the dyeing of the chromable dyestuffs is concerned, they follow closely the behavior of the acid dyestuffs, and the same general principles hold. Since they yield fast-to-boiling shades on nylon, however, they are becoming of increasing importance on this fiber.

PREMETALIZED DYESTUFFS ——— Premetalized dyestuffs dye nylon in the same way as acid dyestuffs, but the complexity of their structures is usually such that only pale to medium shades are possible. They show up differences in irregular-dyeing nylon, probably more so than acid dyestuffs, as their molecular complexity emphasizes differences in orientation and crystallinity, as well as difference in amine end content. Wool, being a much less highly orientated fiber than nylon, is capable of yielding full shades with these rather complex premetalized dyestuffs. On nylon, however, it is unnecessary to employ the high quantity of sulfuric acid that is normally used for wool in the dyeing of these colors.

TABLE III

Chemical Type	Number of Homogeneous Dyestuffs Tested	Light Fastness Range SDC 1-8 scale
Thioindigoid	5	1 to 1-2
Pyranthrone	3	1 to 2
Phthaloylacridone	4	1 to 3-4
Benzoylamino-anthraquinone	6	2-3 to 3-4
Dibenzanthrone	13	3-4 to 5-6
Anthraquinone-carbazole	13	4-5 to 5-6
Indanthrone	7	5-6 to 6-7

DIRECT DYESTUFFS ——— Only those direct dyestuffs that resemble acid dyestuffs in chemical structure are capable of dyeing nylon, and maximum color value is realized only if acid is added to the dyebath making the salt-linkage mechanism again operative. The more complex direct dyestuffs, however, are incapable of dyeing nylon; they only tint this fiber, being unable to penetrate into the fine structure. A direct dyestuff that stains nylon in neutral or acid solution leaves nylon completely white in alkaline solution. The alkali renders the amine groupings completely inactive as follows:

$$\text{—OOC (NYLON CHAIN).NH}_3^+ + \text{Na}^+\text{OH}^- \rightarrow$$
$$\text{Na}^+ \text{—OOC(NYLON CHAIN).NH}_2 + \text{H}_2\text{O}$$

This property is used in the dyeing of nylon-cellulosic unions with dispersed acetate-rayon dyestuffs and direct dyestuffs. An addition of soda ash or like alkaline agent is made to the dyebath to effect reservation of the nylon toward the cellulosic dyestuff.

In general, direct dyestuffs are not of much interest for the dyeing of nylon, their importance lying in the ability of certain members to leave nylon undyed.

BASIC DYESTUFFS———Basic dyestuffs possess excellent affinity for nylon but only under alkaline conditions. Since basic dyes are cationic in nature, dyeing takes place on the carboxylic acid groupings of the nylon, and the dye cation replaces the sodium ion (Na^+) by virtue of its greater affinity for nylon. Under acid conditions the carboxylic acid groupings in the nylon, as shown previously, are not ionized, and so the dye cation cannot attach itself to them. Higher tinctorial value is possible with basic than with acid dyes as there are twice as many carboxylic acid groupings as amine end groups and the basic dyestuffs are themselves stronger tinctorially than acid dyestuffs. Unfortunately, basic dyestuffs possess very low resistance to light on nylon, and their practical outlets are thus very restricted.

AZOIC DYESTUFFS———Azoic combinations cannot be applied to nylon by the normal techniques employed for their application to cellulosic fibers. This is readily apparent on consideration of the chemical structures of the components. The naphthol bodies are readily absorbed from alkaline solution, provided high-temperature application is employed, and these bodies dye nylon as the dispersed acetate-rayon dyestuffs by a hydrogen-bonding mechanism. Unlike the dispersed acetate-rayon dyestuffs, they are soluble in alkaline dyebaths, and increased exhaustion can be realized by the addition of salt, which depresses their solubility in the aqueous dyebath. The active coupling components, viz, the diazonium salts, are stable only in acid solution, and, under acidic conditions, the amine end groupings of nylon are positively charged. With a diazonium chloride, only the chloride anion will be absorbed by the nylon and the dye cation is incapable of penetrating into the nylon; and thus, no coupling is possible.

However, the aromatic bases, like the naphthol bodies, are readily absorbed from alkaline solution, and treatment in an acid nitrite bath effects diazotization and coupling in situ. This constitutes the method employed for the application of azoic dyestuffs to nylon.

VAT DYESTUFFS———Vat dyestuffs are applied from alkaline solution, but high-temperature dyeing must be resorted to, as the alkaline leuco anions possess slow diffusion rates into nylon at normal vat-dyeing temperatures. The mechanism here is hydrogen bonding, and it is postulated that the strength of the bond governs the proportion of acid leuco formed. The more powerful the bond, the greater the proportion of acid leuco compound formed, and the less stable is it to light. An analysis of the results of daylight exposure shows that a definite correlation exists between the light fastness realized on nylon and the chemical constitutions of vat dyestuffs. This relation gives some support to the above postulation. Table III gives the light fastness of the main constitutional dyestuff groups.

Therefore, it appears that the strength of the hydrogen bond is at least in part governed by the molecular complexity and structure of the vat dyestuff.

A steaming treatment tends to break the hydrogen bond and confers increased light resistance. But migration to the surface is brought about during steaming, and wet and rubbing fastness deteriorate.

As insufficient work has been carried out on the fundamental dyeing mechanism of vat dyestuffs on nylon, there is here quite a considerable field for research.

The only grouping in Table I that has not yet been mentioned is the acetyl amino group present in nylon. This does not appear to take any part in dyeing mechanisms. If nylon 66 is acetylated and then dyed with an acid dyestuff under optimum conditions of pH, it is found that very low color value is realized. Thus, support is lent to the salt-linkage theory that acid dyestuff is adsorbed on the amine end groupings.

WOOL-NYLON UNIONS

LEVEL-DYEING ACID DYESTUFFS ——— Level-dyeing acid dyestuffs dye both components of a wool-nylon union by a similar mechanism. The partition of the dyestuff between the two fibers is dependent upon the depth of shade being dyed. As these dyestuffs possess a greater intrinsic anionic affinity for nylon than they do for wool, when pale shades are dyed and saturation of the nylon does not occur, the nylon is dyed heavier than the wool. As the depth of shade is increased, a concentration of dyestuff is reached where the nylon and the wool are dyed to an equal depth of shade. This corresponds to the saturation of the amine end groupings in the nylon. Beyond this point build-up occurs only on the wool component, which contains 20 times more dyeing sites than nylon. The percentage depth of shade at which equality is attained on the wool and nylon varies widely from dyestuff to dyestuff and is dependent upon the anionic affinity, basicity, diffusibility and commercial purity of the dyestuff.

Solidity in pale shades is readily realized on wool-nylon unions by employment of a colorless sulfonated body possessing a greater intrinsic anionic affinity for nylon than the level-dyeing acid dyestuffs. Such a compound is Calsolene Oil HS, which appropriates the amine dyeing sites that would otherwise be occupied by the dyestuffs. Obviously, the paler the shade being dyed, the higher the quantity of sulfonated body necessary to prevent preferential dyeing of the nylon.

No practical quirk can be employed to alter the partition of the dyestuffs on wool-nylon unions in the dyeing of heavy shades. Thus, with level-dyeing acid dyestuffs, solidity of shade is unobtainable beyond the saturation depth given by the amine end content of the nylon, and with this class of dyestuffs heavy shades are not possible.

On 100% nylon a mixture of the three disulfonated acid dyestuffs, Lissamine Fast Yellow 2G, Azo Geranine 2G and Solway Blue BN behaves as a straight dyestuff. When this mixture is applied to wool-nylon unions, the blue component dyes the wool preferentially. In the absence of a blue which partitions itself equally between the wool and the nylon, it is fortunate that there are available monosulfonated blue dyes of a hue similar to Solway Blue BN which dye the nylon preferentially. Thus, to obtain solidity of shade on wool-nylon unions in pale to medium shades, the following combination proves of interest:

Dyes	Types
Lissamine Fast Yellow 2G	Dibasic
Azo Geranine 2G	Dibasic
Solway Blue BN	Dibasic
Solway Blue RN	Monobasic
Calsolene Oil HS	Monobasic colorless

Although recommendations were made under the discussion of acid dyestuffs not to mix dyestuffs of different types, provided the practical dyer is familiar with the behavior of the dyestuffs, it is permissible and sometimes advantageous to do so as exemplified with the above combination.

ACID MILLING AND PREMETALIZED DYESTUFFS———The behavior of these classes of dyestuffs in the dyeing of wool-nylon unions follows the same general principles as the level-dyeing acid dyestuffs as far as partition is concerned, but it is considerably more diverse. As a first step to clarifying the situation, it is convenient to classify arbitrarily the dyestuffs on a basis of partition between the wool and the nylon for shades of medium depth. This classification immediately gives the dyer an indication as to which dyestuffs will give solid shades in pale, medium and heavy depths.

For the dyeing of pale to medium shades a neutral-dyeing technique is recommended with the use of the dyeing assistant, Carbolan Salt A. By this means level dyeing is realized on the wool component, but as the partition is in favor of the wool under these neutral-dyeing conditions, it is necessary to augment the shade on the nylon by the use of dispersed acetate-rayon dyestuffs. Although this expedient tends to lower the wet-fastness properties of the dyeing, a back-soaping treatment yields a reasonable degree of fastness.

In general, since the premetalized dyestuffs exhibit even poorer building-up properties on the nylon component of a wool-nylon union than on 100% nylon only pale to medium solid shades can be realized. Strangely enough, mixture shades of certain premetalized dyestuffs do not give rise to partition difficulties with increasing depth of shade, providing the saturation point on the nylon is not reached.

CHROME DYESTUFFS———Without a doubt, the chrome dyestuffs are best for the production of heavy shades on wool-nylon unions. The afterchrome method is the only one practicable, as already indicated, but here again, a reducing treatment after chroming should be employed to eliminate residual dichromate in the nylon. The chrome dyestuffs, however, build up more than the acid milling dyestuffs on the nylon component and for this reason are eminently suitable for the production of brown, maroon, navy-blue and black shades.

In the dyeing of wool-nylon unions, it is therefore necessary to have quite a detailed knowledge not only of the behavior of the individual dyestuffs but also of their behavior in admixture with each other, and in particular a knowledge of the partition between the fiber components. However, satisfactory results are being achieved on the bulk scale even in the production of fast-dyed shades.

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DISCUSSION

Question: What group of dyes do you recommend for dyeing 50-50 wool-nylon blends in light to dark shades?

Answer: For dyeing heavy shades on such blends with maximum fastness properties I would recommend chrome dyestuffs, which are applied from a bath containing ammonium acetate. A high temperature of 95-98°C is advantageous in the application of both acid and chrome dyestuffs. The bath is exhausted with 4% of formic acid, 85%. When exhaustion is complete, about 2% of dichromate based on the weight of the fiber is added directly to the bath, and chroming is carried out for one hour at 90-95°C. Reduction of bichromate is carried out in the same bath by addition of 4% of sodium thiosulfate. The action of the thiosulfate is continued for 20 minutes while the bath is allowed to cool, provided the temperature is not allowed to drop below 70°C.

Chrome dyestuffs give heavy shades on wool-nylon unions, particularly for browns, maroons, navies, blues and blacks. For pale to medium shades I would suggest selected neutral dyeing acid dyestuffs. By use of an assistant such as Carbolan Salt A, level dyeings with maintenance of solidity of shade between wool and nylon can be obtained.

Question: Can you explain why we have obtained better wash fastness for heavy shades with acid-milling colors when we have started the dyeing at high temperature with 2% of formic acid, 85%, than when we have started dyeing in the presence of ammonium sulfate and ended up by exhausting the color with formic acid?

Answer: I have never observed that phenomenon. Possibly the quantity of the chemicals employed caused the acid dyes to go out of solution and thus not penetrate but time held at high temperature may also be the explanation.

Question: What has been your experience with ammonium chloride in dyeing?

Answer: Although I have never actually used ammonium chloride in dyeing, I see no reason why ammonium chloride and other salts such as ammonium oxalate should not behave like ammonium acetate in exhausting neutral acid dyestuffs on nylon.

Philadelphia Section Meeting Report

January 19
Kugler's Restaurant, Philadelphia

PRIOR to the technical session the new section Chairman, A E Raimo of John Campbell & Co presented the outgoing Chairman, R B Stehle of the Allegheny Dye Works with a pen and pencil set and a suitably engraved gavel.

The following were announced as Committee Chairman for 1951:—

Program—Margaret B Hays, U S Naval Experiment Station, Philadelphia

Membership—Matthew A Noonan, Becco Sales Company

Publicity — Thomas J Scanlon, Calco Chemical Division

Dining—Frederick V Traut, Globe Dye Works

Intersectional Contest — A C Nuessle, Rohm & Haas

Outing—John Koch, Jr, Artcraft Sales Corporation; Richard L Jones, Royce Chemical Company

Bylaws — Percival Theel, Philadelphia Textile Institute

Sectional Research—Dr M J Reider, Geo W Bollman Company

The technical portion of the program served to honor the Section's 1950 Intersectional Contest Committee for the time and effort put forth in producing the paper "The Relating of Laboratory Exhaust Data to Mill Practice" which was presented by Harry F Clapham of E I du Pont de Nemours & Co, Inc, Chairman of the Committee. Following this, Dr Mason Hayek, Jackson Laboratory, E I du Pont de Nemours & Co, Inc presented a paper on "The Electrical Resistance of Textile Materials."

127 members and guests attended the dinner. The technical session attracted 154.

Respectfully submitted,
THOMAS HART, *Secretary*

Synthetics Group —

STUDIES IN TEXTILE PRINTING: PRACTICAL APPLICATIONS OF THE ANALYTICAL METHOD*

R D GREENE, A F KLEIN, F FORDEMWALT

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The ANALYTICAL METHOD of evaluating vat prints has been applied to the study of vat gums, pigment-pad-steam vat printing, screen printing, and to comparisons between laboratory and mill agers. The method has been found to be applicable to situations that could not be treated by evaluations depending on color-value measurements alone.

INTRODUCTION

ALONG with many others who are vitally interested in placing the textile-printing industry on a more and more scientific basis, Calco has undertaken a study of the fundamental principles involved in the process of vat printing. It soon became evident in this study that a sound and thorough method of evaluating the results was needed. Such a method was developed and has been described in the *American Dyestuff Reporter* under the general title, "Studies in Textile Printing, I *(1)* and II *(2)*." Part I describes in detail a proposed set of terms used in the evaluation and explains their derivation, and Part II describes the analytical method.

TERMINOLOGY

As shown in Table I, three measurements of a vat print are made. These are (1) the amount of dye deposited by printing; (2) the amount remaining on the fabric after aging, oxidizing and soaping; and (3) the color value of the completed print. From these measurements three values are calculated, viz:

(a) *Percent Fixation (PF)*—The relation between the amount of dye deposited on the fabric by printing and the amount remaining after aging, oxidizing and soaping is shown by the *percent fixation* (PF).

(b) *Color Efficiency (CE)*—The relation between the amount of dye fixed and the color value obtained is designated as *Color Efficiency* (CE) and shows the true comparative effect which results from differences in dye distribution, penetration, etc.

(c) *Printing Efficiency (PE)*—The relation between the color value obtained and the amount of dye deposited shows the real relative money value of the over-all process in the term *printing efficiency* (PE). From a consideration of the varying amounts of dye applied, the portion fixed and the visual effect obtained therefrom, a revealing picture of the relative value of two formulations or procedures is presented.

Color values and efficiencies are expressed in relation to an arbitrary standard representing an established procedure or laboratory control. Thus an efficiency value of 100 indicates only that the process is equal to the standard.

METHOD OF ANALYSIS

The method of analysis consists of extracting the dye with solvent from a measured sample cut from the print being evaluated. The dye concentration of the extract and the color value of the print are measured spectrophotometrically.

A striking example of the advisability of having a complete story for a comparison of printing gums is found in Table I, which presents data obtained in the course of an evaluation of new thickening agents.

All three of the printing color pastes were made up alike except for the thickener used. All contained equal amounts of Vat Pink FF and chemicals, and all were processed together.

It is seen that the visible results with color value alone as the criterion would indicate that "B" was outstanding. When the amount of dye deposited and the percent fixation were known, however, the picture changed considerably and "C" proved to give the best money value as indicated by the high value of its over-all printing efficiency (PE).

So many similar instances showing the value of the analytical results have been encountered that it was thought this method would prove of interest for general use. Accordingly, this paper is presented to illustrate some applications of the method to various aspects of textile printing with vat dyes.

PRACTICAL APPLICATIONS

INFLUENCE OF VAT CARRIER THICKENER———The degree of conversion to which a starch has been subjected has long been recognized as having a great influence on its behavior as a vat printing thickener. Also, the relative value of the true gums has often been a matter of debate because of a lack of quantitative data. With the application of the analyti-

TABLE I

	Mfg dye per 100 sq cm of print					
	Deposited*	Fixed*	Color Value*	Percent Fixation**	Color Efficiency**	Printing Efficiency**
A—Standard Gum	15.7	11.7	100	75	100	100
B—An Experimental Gum.	17.7	14.2	120	80	100	106
C—An Experimental Gum.	8.3	7.0	60	84	100	113

* Measured values ** Calculated values

* Presented before Twenty-ninth Annual Convention in Portsmouth, N H, on September 30, 1950.

TABLE II
FORMULAS FOR PRINTING GUMS

	Standard Gum	Gum No. 1	Gum No. 2
	Parts	Parts	Parts
Corn starch	6.0	5.0	6.5
B-2 gum	7.5	28.0	...
Gum tragacanth (6 oz. gal.)	..	..	6.5
Sodium carbonate	4.5	4.5	4.5
Potassium carbonate	4.5	4.5	4.5
Hydro (sulfoxylate)	7.0	7.0	7.0
Glycerine	5.0	5.0	5.0
Water to make	100	100	100

cal method, however, quantitative data may be obtained from which an evaluation can be made. As an example, a comparison was made between three printing gums.

Table II presents the compositions of the gums used, and Table III shows the evaluations of the corresponding prints.

Gum No 1 with Jade Green gave results that were fairly close to those obtained with the standard gum. With Fast Yellow, however, the same gum gave results that were much poorer than those obtained with the standard. The effect in this case is interesting in that a very low percentage of color became fixed but that which did fix was highly effective.

Gum No 2 with Jade Green was superior to the standard in color value (CV) and color efficiency (CE) but inferior to the standard in percent fixation (PF) and slightly inferior in printing efficiency (PE). Calcosol Fast Yellow, on the other hand, when printed with Gum No 2 shows a very definite increase in color value. This is seen to be due to a relatively heavy deposition, however, and as a result the printing efficiency (PE) is not greater than for the standard.

COMPARISON OF LABORATORY AND MILL AGERS——In order to obtain a practical tryout of the analytical method in the field, a series of trials was conducted in which the aging process was the variable to be studied. Through the co-operation of several textile printers we were able to age prints of identical composition in different plants and in a wide variety of agers.

In order to keep the data from becoming too extensive, only selected typical results from four separate mills are presented. Each table presents data which represent a separate test comparing the laboratory results with those obtained in mill agers. No two sets of tests were run at the same time, and no comparisons between mills can be made.

For each test three separate prints, all on 80x80 bleached cotton in a conventional starch-British gum clear, were prepared in the laboratory. These were as follows:

(1) 10% Calcosol Vat Pink FF
(2) 5% Calcosol Jade Green
(3) 10% Calcosol Fast Yellow

A sample of each print was aged, oxidized and soaped in the laboratory immediately after printing and was used as the reference standard for all color values (CV), color efficiencies (CE) and printing efficiencies (PE) of the set. Other samples of the dried prints were placed in sealed containers and were taken to the mill, where they were aged in different agers at different times on the day after being printed. The aged and oxidized prints were then returned to the laboratory, where they were soaped and then evaluated. The results are summarized in the following Tables IV-VIII, inclusive.

It will be noticed in these tables that the color values (CV) and printing efficiencies (PE) are the same. This results from the fact that only one print was prepared for each series and different swatches of this were aged in the different agers. Since only one dye deposition value is involved, the printing efficiency values of all samples from a single print must be in the same ratio as the corresponding color values. They become equal when all are referred to the same standard.

A difference, such as shown by the relatively good performance of ager No 1 (Table IV), particularly as compared with the poorer values for No 3, can hardly have been accidental but must represent real superiority of No 1.

The four agers represented in Table V are seen to give remarkably uniform results.

TABLE III
COMPARISON OF PRINTS PREPARED FROM THE GUMS LISTED IN TABLE II

Prints were on 80x80 cotton from an engraved chromium-plated roll.

5% Prints of Calcosol Jade Green NP Double Paste

Printing Gum	Mg Dye Present in 100 sq cm of Print					
	Deposited	Fixed	CV	PF	CE	PE
Standard	3.60	3.55	100	98	100	100
1	3.69	3.04	95	82	110	93
2	4.56	3.75	120	82	115	95

10% Prints of Calcosol Fast Yellow Printing Paste

Printing Gum	Mg Dye Present in 100 sq cm of Print					
	Deposited	Fixed	CV	PF	CE	PE
Standard	8.75	8.0	100	91	100	100
1	9.01	2.75	55	31	160	59
2	11.0	9.25	125	84	108	100

TABLE IV
MILL A

Color	Ager No.	CV	PF	CE	PE
Pink FF (PF of std = 80)	1	102	78	105	102
	2	95	76	100	95
	3	94	70	108	94
	4	94	74	101	94
	5	98	76	103	98
Jade Green (PF of std = 91)	1	102	86	108	102
	2	76	84	82	76
	3	73	74	90	73
	4	84	88	87	84
	5	80	87	84	80
Fast Yellow (PF of std = 87)	1	88	75	102	88
	2	65	72	78	65
	3	61	73	73	61
	4	77	70	95	77
	5	67	70	83	67

TABLE V
MILL B

Color	Ager No.	CV	PF	CE	PE
Pink FF (PF of std = 82)	1	101	80	103	101
	2	102	80	104	102
	3	102	82	102	102
	4	102	82	102	102
Jade Green (PF of std = 100)	1	100	95	105	100
	2	102	91	111	102
	3	101	91	110	101
	4	101	95	106	101
Fast Yellow (PF of std = 81)	1	87	83	85	87
	2	90	83	88	90
	3	85	84	83	85
	4	80	75	87	80

TABLE VI
MILL C

Color	Ager No.	CV	PF	CE	PE
Pink FF (PF of std = 82)	1	90	85	87	90
	2	73	72	83	73
	3	67	77	71	67
	4	100	86	95	100
	5	100	86	95	100
Jade Green (PF of std = 95)	1	95	97	93	95
	2	101	92	104	101
	3	100	93	102	100
	4	102	92	105	102
	5	98	93	100	98
Fast Yellow (PF of std = 64)	1	101	58	111	101
	2	101	62	104	101
	3	98	64	98	98
	4	103	64	104	103
	5	103	64	103	103

TABLE VII
MILL D

Color	Ager No.	CV	PF	CE	PE
Pink FF (PF of std = 79)	1	101	78	102	101
	2	97	77	100	97
	3	100	79	100	100
	4	100	78	101	101
Jade Green (PF of std = 93)	1	93	93	93	93
	2	97	93	97	97
	3	100	100	93	100
	4	95	93	95	95
Fast Yellow (PF of std = 78)	1	90	73	95	90
	2	95	73	100	95
	3	89	73	95	89
	4	94	74	98	94

Except for the results with Pink FF in agers No 2 and No 3 (Table VI) the uniformity in the operation of these five agers is excellent. It is not improbable that some accidental incident with the pink swatch accounts for these anomalous values. The high efficiency values with Fast Yellow indicate generally excellent ager operation.

The data given in Table VII indicate uniform ager operation.

All the results in Tables IV to VII inclusive indicate generally good mill practice with only an occasional ager falling off in its operating efficiency. These data also show that the laboratory ager gave results generally equivalent to the best mill practice.

EFFECT OF RUNNING TIME——Other samples of the prints were sent through mill agers at different times of the day to see in what way aging conditions might vary with the length of time the agers had been in operation. The results of tests on three agers are summarized in Table VIII.

These agers were being operated in a way that did not cause any loss of efficiency due to longer running time.

SPECIAL PRINTING METHODS——During the past several years considerable interest has been displayed in the pigment-print-pad-steam method of vat printing. In this process the vat pigment is printed onto the fabric without alkali or reducer but with a binder. The pigment print is then padded through an alkaline reducing bath and steamed. Thus, it becomes possible to print vat dyes and to age the prints at any convenient later time without trouble from decomposing hydrosulfite, a feature particularly attractive to the screen printer. Since so many factors involved in this type of printing are different from those involved in the more conventional methods, it did not seem probable that any reliable comparisons or evaluations of these pigment printing methods could be made except by an analytical method. The analytical method was therefore used for evaluating several different pigment carrier binders in pigment-print-pad-steam vat printing tests. Corresponding conventional vat prints from a starch-British gum clear were used as the reference standards for all CV, CE and PE values. The results are presented in Tables IX and X. All prints were prepared on 80x80 cotton from an engraved chromium-plated roll.

Gum No 3 is obviously a poor carrier for use in print-pad-steam printing. Gums No 1 and No 4 are more suitable for this type of printing, but in all cases the efficiencies of this process were less than those of the conventional method of applying vats.

SCREEN PRINTING OF VATS——No color-value measurements or other regularly employed methods of evaluation can provide a reliable comparison between screen printing and roller printing of vat dyes. With an analytical evaluation, however, screen prints and roller prints are readily intercompared, and the relative economies of the two processes with respect to efficient utilization of dye can be reliably determined.

Some typical comparisons are presented in Table XI wherein are shown data from some laboratory prints by both screen and roller printing methods. The standard gum given in Table II was used for both the roller and screen prints.

The screen printing of vat colors was much less efficient than roller printing.

TABLE VIII
EFFECT OF RUNNING TIME ON MILL AGERS

Ager	Color	PE at time of day indicated			
1		11:00	12:55	2:07	3:25
	Pink FF	100	101	97	102
	Jade Green	101	102	100	100
	Fast Yellow	83	81	92	84
2		10:04	12:15	2:45	
	Pink FF	101	102	103	
	Jade Green	100	96	100	
	Fast Yellow	87	78	85	
3		10:53	12:30	2:30	
	Pink FF	95	88	100	
	Jade Green	76	81	88	
	Fast Yellow	65	73	80	

TABLE IX
FORMULAS FOR CARRIER BINDERS USED IN PIGMENT-PRINT-PAD-STEAM TESTS

	Standard Gum	No. 1	No. 2	No. 3	No. 4
Wheat starch (6%)		42	42	..	..
Shopal gum (6%)	Same as standard given in Table II	14	14	..	70
Keltex (4%)		14	..	..	..
Gum tragacanth (5%)		..	14	..	..
Methocel (4%)		..	..	35	..
RPG gum (12½%)		..	..	40	..
Water		15	15	10	15
Kromfax solvent		5	5	5	5
Total		90	90	90	90

TABLE X
EVALUATION OF PIGMENT-PRINT-PAD-STEAM PRINTING

5% Prints of Calcosol Jade Green NP Double Paste

Printing Gum	Mg Dye Present in 100 sq cm of print: Deposited	Fixed	CV	PF	CE	PE
Standard	3.60	3.55	100	98	100	100
1	5.87	5.73	115	98	71	70
2	5.88	4.25	75	71	63	46
3	3.95	3.17	50	80	56	46
4	6.08	5.57	122	92	78	72
10% Prints of Calcosol Fast Yellow Printing Paste						
Standard	9.75	8.0	100	82	100	100
1	11.0	9.25	100	84	87	89
2	11.5	9.50	90	83	76	76
3	8.25	8.00	55	97	55	65
4	11.3	10.3	105	91	82	91

TABLE XI
COMPARISON OF SCREEN AND ROLLER PRINTS USING THE ROLLER PRINT AS THE STANDARD

5% Prints of Calcosol Jade Green NP Double Paste

	Mg Dye Present in 100 sq cm of Print: Deposited	Fixed	CV	PF	CE	PE
Roller Print	3.60	3.55	100	98	100	100
Screen Print	10.6	10.2	190	97	68	65
10% Prints of Calcosol Fast Yellow Printing Paste						
Roller Print	9.75	8.0	100	82	100	100
Screen Print	26.5	13.7	150	51	87	55

In spite of the excellent percent fixation (PF) of Jade Green in screen printing, the color efficiency (CE) and printing efficiency (PE) of this process were low. These comparisons might have been more favorable for the screen prints if the compositions of the pastes had been adjusted so that more nearly equal amounts of dye had been deposited.

SUMMARY

The analytical method for evaluating vat prints and vat printing methods has been applied to several practical printing situations.

The method has been shown to be useful in evaluating printing processes that could not be compared by the usual testing procedures, which depend on color values alone.

REFERENCES

(1) Fordemwalt and Witschonke, *Am Dyestuff Reptr*, 39, 607 (1950).
(2) Witschonke and Fordemwalt, *Am Dyestuff Reptr*, 39, 621 (1950).

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Rhode Island Section Meeting Report

January 26

Providence Engineering Society, Providence

APPROXIMATELY 150 were in attendance to hear Paul J Choquette, Coordinator of Research, General Dyestuff Corp speak on "Current Trends in Dyeing Synthetic Fibers" and also to view General Electric's movie "Textiles Unlimited."

Chairman Peter G Kolupaev appointed the following committee chairmen for 1951:

Intersectional Contest—Edward H Gamble
Sectional Research Advisory Committee—Raymond W Jacoby
Publicity—John Wilson
Outing—John Harley
Corporate Membership—Robert P Wood
Dining—Francis H Casey
Technical Program—Ernest J Chornyei

Respectfully submitted,
ROBERT G THOMAS, *Secretary*

—♦ ♦—

Utica Technical Institute Student Chapter Report

January 18

PLANS were made for presentation of a paper in the contest at the New York Convention.

Speaker for the meeting was Wilfred A Boule, A D Julliard & Co, who spoke on "Manufacturing, Dyeing and Finishing of Corduroy."

Respectfully submitted,
GEORGE AUMICK, *Secretary*

Olney Medal Candidates

The Committee of Award would like suggestions regarding candidates for this year's Olney Medal. They should be in the hands of H C Chapin, Secretary of the Association, not later than March 9th. Data on the accomplishments of candidates should be specific in such matters as journal references or patents, but all definite information will be helpful. Letters from several sponsors of one candidate are needless, except for giving additional data.

Under the rules the basis of award is outstanding achievement in the field of textile chemistry, which is understood to include the development of chemical agents or chemical processes used in the manufacture of textiles or methods of evaluation.

In making awards, the Committee need not be confined to the consideration of any one specific achievement or contribution but may in its discretion consider the sum total of various and continued contributions to the field no matter of how long duration.

The citation of the award drawn by the Committee and accompanying the presentation of the medal shall set forth clearly the occasion for the award.

The voting members of the Committee are Wyss L Barker, William D Appel, Harold W Leitch, C Norris Rabold and Henry A Rutherford.

CALENDAR

COUNCIL

April 20 (Raleigh, N. C.), June 15 (Hotel New Yorker, New York), October 18 (Hotel Statler, New York), November 16 (Hotel New Yorker, New York).

GENERAL RESEARCH COMMITTEE

April 20 (Raleigh, N. C.), June 15 (Hotel New Yorker, New York), October 18 (Hotel Statler, New York), November 16 (Hotel New Yorker, New York).

NATIONAL CONVENTIONS

1951: October 17-18-19, Statler, New York.
1952: Nov. 6-8, Boston.
1953: September 17-19, Hotel Stevens, Chicago.

HUDSON-MOHAWK SECTION

Meetings: Mar. 16 (Albany), May 11 (Albany), June 22 (Annual Outing).

MIDWEST SECTION

Meetings: May 5 (Hotel Schroeder, Milwaukee), June 16 (Outing, Lake Lawn Lodge, Delavan, Wis.), September 29 (Morrison Hotel, Chicago).

NEW YORK SECTION

Meetings: March 9 (Hotel New Yorker), March 30 (Swiss Chalet), May 4 (Swiss Chalet), June 15 (Outing).

NORTHERN NEW ENGLAND SECTION

Meetings: March 9 (M I T, Cambridge), April 13 (L T I, Lowell), May 18 (Andover C C, Andover), October 26 (L T I, Lowell), November 30 (Boston, Annual Meeting).

Outing: June 8 (Merrimac V C C, Methuen).

PHILADELPHIA SECTION

Meetings: March 16, April 13, September 14, October 26, December 7, January 18, 1952 (all at Kugler's Restaurant, Philadelphia).

Outing: June 1 (Torresdale-Frankford Country Club).

RHODE ISLAND SECTION

Meetings: Feb. 23 (Johnson's Grill), March 30 (Providence Engineering Society), April 27 (Wannamoisett Country Club), May 25 (Johnson's Grill), October 26 (Providence Engineering Society), November 16 (Johnson's Grill).

Outing: June 22 (Wannamoisett Country Club)

SOUTH CENTRAL SECTION

Meetings: May 12, December 1 (both in Hotel Patten). Summer Outing: August 24-25.

SOUTHEASTERN SECTION

February 24 (Talladega, Ala.), May 5 (Atlanta, Ga.), June 8-9 (Annual Outing, Radium Springs, Albany, Ga.), September 8 (Columbus, Ga.), December 8 (La Grange, Ga.).

WESTERN NEW ENGLAND SECTION

Meetings: March 16 (Danbury), May 4, June 22 (Outing).

OTHER EVENTS

AMERICAN ASSOCIATION OF TEXTILE TECHNOLOGISTS

Meetings: February 28 (Hotel Commodore, New York); April 4, May 2, June 6, September 12, October 3, November 7, December 5 (Builders Club, New York).

AMERICAN SOCIETY FOR TESTING MATERIALS

Committee E-12 on Appearance, February 27, Washington, D. C.

Committee D-13 on Textile Materials, March 14-16, New York.

Committee D-12 on Soaps and Other Detergents, March 19-20, New York.

Spring Meeting and Committee Week, March 5-9, Cincinnati, Ohio.

Annual Meeting, June 18-22, Atlantic City, N. J.

Spring Meeting and Committee Week, March 3-7, 1952, Cleveland, Ohio.

Annual Meeting, June 23-27, 1952, New York, N. Y. (The biennial Apparatus and Photographic Exhibits will be held in conjunction with this meeting).

NATIONAL ASSOCIATION OF TEXTILE MACHINERY MANUFACTURERS

Exhibit of American Textile Machinery, April 26-May 1, 1954, Atlantic City Exhibition Hall, Atlantic City, N. J.

TEXTILE RESEARCH INSTITUTE

Annual Meeting, Nov. 8-9.

Haller and Silva to Speak at R I Meeting

HERBERT C HALLER, Assistant Director of Research, Forstmann Woolen Company and Manuel Silva, Production Manager of the Hayward-Schuster Woolen Company, will be guest speakers at the Friday (Feb 23) meeting of the Rhode Island Section to be held at Johnson's Hummocks on Allens Ave, Providence. Mr Haller's talk will be on "Mechanism of Felting in the Fulling Operation." Mr Silva will speak on "Face Finished Woolens."

The Rhode Island Section extends a cordial invitation to the Northern New England Section to attend this meeting.

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NNE Meeting Dates

FOLLOWING are the dates and sites for the 1951 meetings of the Northern New England Section:

March 9—M I T, Cambridge
April 13—L T I, Lowell
May 18—Andover C C, Andover
June 8—Outing, Merrimac V C C, Methuen
October 26—L T I, Lowell
November 30—Boston, Annual Meeting

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Membership Applications

SENIOR

Raymond S Leonard—Chemist & Dyer, Fremont Hosiery Mills, Inc, Thomasville, N C. Sponsors: R H Smith, L W Stevens.

Arnold Liebman—Overseer of Dyeing, Malden Spinning & Dyeing Co, Malden, Mass. Sponsors: W W Pennock, M A Dimon.

H K Livingston—Research Group Leader, E I duPont de Nemours, & Co, Inc, Wilmington 99, Del. Sponsors: C A Sylvester, C K Black.

Frank E Lizer—Dyer & Foreman, Celanese Corp of America, Amcelle, Md. Sponsors: B F Pimentel, J F Ash.

Ralph A Madaris—Dyer & Finisher, G H Rauschenberg Co, Inc, Dalton, Ga. Sponsors: F L Kibler, J M Patton.

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Joseph L B Plante—Dyer, Bradford Dyeing Assn, Bradford, R I. Sponsors: R S Highling, E B Law.

Gerald E Rammel—Chemist, Delta Finishing Co, Div of J P Stevens Co, Inc, Attleboro, Mass. Sponsors: R W Davie, R L Merrow.

Jorge G Ramos—Tech Sales, Schneiter y Cia, Santiago, Chile. Sponsors: J P Bauer, M G Stern.

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Frank C Harris—Supt, Republic Cotton Mills, Great Falls, S C.

Edward F Johnson—Dyer, Paul Whitin Co, Northbridge, Mass.

Shoji Kamiya—President, Takase Dyeing & Printing Works, Ltd, Osaka, Japan.

Robert M Lacy—Engr in Charge, A & M Labs, General Electric Co, Bridgeport, Conn.

Everett L McCleary—Sales Engr, General Electric Co, Schnectady, N Y.

Jack M Mizoguchi — Research Engr, Shinko Rayon Co, Ltd, Tokyo, Japan.

Eugene Naegeli—Industrial Engr, Princeton Knitting Mills, Inc, Watertown, Conn.

Fusao Yamaguchi—Mgg Director, Taihei Shoko Kaisha, Ltd, Tokyo, Japan.

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James A Baird—Student, New Bedford Textile Inst, New Bedford, Mass. Sponsor: F Tripp.

• PATENT DIGEST •

METACHROME DYEING—— Alkaline Earth Salts Added

C, 4, 06

U. S. Pat. 2,520,080

(American Cyanamid—Amick, Watkins, Millson—Aug. 22, 1950)

The main problem in dyeing fabrics according to the metachrome method is inadequate penetration frequently caused by premature reaction of the chrome mordant with the dyestuff. Dyes which do not penetrate readily have been generally considered hitherto as unsuitable for this method. It was recently found (U. S. Pat. 2,434,178, cf. REPORTER 1948, 396) however, that cationactive agents in "colloidized" state either alone or combined with the dye or the mordant were capable of increasing the penetrating effect. According to the present specification a further improvement is possible using certain chromatable dyes, having no Nitrogen group in o-position to the azo group. Examples are: the dyestuffs *C I* 203 (e g, Eriochrome Black T) or 652 (Omegachrome Red B).

An alkaline earth salt, preferably magnesium sulfate, is added to the dyebath. In using the forementioned dyestuff class the cation-active agent suggested in U. S. P. 2,434,178 can even be omitted. It is essential to keep the pH relatively high at the start, decreasing during the dyeing operation. The anion of the earth alkaline salt must not form complexes with the chromium salts. In working this way, a marked increase in depth of shade was observed and no scum formation occurred. According to one of the examples, a dyebath composed of 2% Eriochrome Black T, 2% ammonia, 3-10% $MgSO_4$ was employed and a sample dyed at the boil for 30 minutes. Thereafter the water volume was replenished, 2% of acetic acid was added and the bath was heated again to the boil. This dyeing was compared (by a reading on the spectrophotometer) with the color value of a similar dyeing carried out without using magnesium sulfate. The color value proved to be more than 300% of that obtained according to the standard method.

References cited by the Patent Office, among others:

U. S. Pat. 1,511,359 (1924—A. G. f.Anilin Fabr.): hardening of wool fibers avoided by dyeing in the presence of a chromium salt and adding sulfite waste liquor to the dyebath.

PAUL WENGRAF

EXPEDITED PATENT SERVICE

Patents listed in this issue, or any patent you may need, mailed within 24 hours of receipt of order, week ends and holidays excepted. Save 6 to 10 days with this special service to readers of AMERICAN DYESTUFF REPORTER. Patent number must be given, plus title or general subject. 50c per patent, 10c extra if wanted airmail. PATENT PROCUREMENT SERVICE, Box 4127 ADR, Washington 15, D. C.

U. S. Pat. 1,060,002 (1913—Farbenf Bayer): use of special brown to black shades from azodyes, prepared from nitro-amino phenols coupled with naphthols, for dyeing wool in presence of a chrome mordant in the one-bath chrome dyeing method.

U. S. Pat. 1,025,267 (1912—Heidenreich): dyeing on wool with blue azodyes, prepared from naphthols and aminophenol sulfonic acid, on chrome mordant.

U. S. Pat. 941,399 (1909—Cassella): a one-bath chrome dyeing process effected by preparing a dyebath from a chrome mordant dye (Anthracene Chromate Brown or Green), potassium dichromate and Mg-, Ca-, or Ba salts. The acid dissociating from the divalent salts accelerates the adsorption.

According to U. S. Pat. 2,434,178 (REPORTER 1948, 396) the cation active agent (i e, octadecyl guanidine reacted with ethylene oxide) was colloidized with dextrine, dried, powdered and added to the dyebath.

METACHROME DYEING—— Zinc or Cadmium Salts Added

C, 4, 06

U. S. Pat. 2,520,081

(American Cyanamid—Amick, Royer—Aug. 22, 1950)

This patent refers to U. S. Pat. 2,434,-178 and although the method described can be considered a remarkable progress, admittedly it was not quite satisfactory with respect to the color strength obtained. A further improvement has been achieved by the present invention by adding a soluble metal salt of the "family of the second group of the periodic system", exemplified by Zn or Cd. Moreover, it is essential that the pH of the dyebath must not be greater than 9.5 at the start, gradually decreasing and becoming more acid down to pH 4, which is approximately the isoelectric point of wool. In contrast to the foregoing patent (U. S. Pat. 2,520,080), which otherwise shows some analogies with the present process, the dyeing operation can be carried out with practically all dyes suitable for metachrome-dyeing. In one of the examples Omega Chrome Black (*C.I.* 299) is mentioned. Dyeing requires no new technique and the quality of the acid employed is not critical. An example calls for a dyebath, containing the dye *C.I.* 203 (Erio Chrome Black T), aqueous ammonia, a colloidized cation active agent (as described in U. S. Pat. 2,434,178), further cadmium- (or zinc-) chloride and potassium dichromate. The sample is first dyed in this bath, which is then brought to the boil. The water is then replenished whereupon acetic acid is added and the bath brought to the boil again. The shade, measured by spectrophotometer, was 232% stronger than that which resulted when the cadmium salt was omitted.

References cited by the Patent Office, among others:

U. S. Pat. 2,434,178 (see above, REPORTER, 1948, 396).

U. S. Pat. 941,399 (Cassella), see above (U. S. Pat. 2,520,080).

U. S. Pat. 661,985 (1900—A. G. f.Anilinfabr.): preparing a mordanting bath for prechroming wool from potassium dichromate + ammonium sulfate, thus slowly decomposing the dichromate. This method is further proposed for one-bath dyeing, exemplified by Anthracene Chrome Red dyed in the presence of ammonium sulfate and dichromate.

Correction

The illustration which appears on page 5 of the January 8, 1951 issue does not apply to U S Pat 2,513,209 as the caption erroneously states. Instead, the illustration which follows correctly applies.

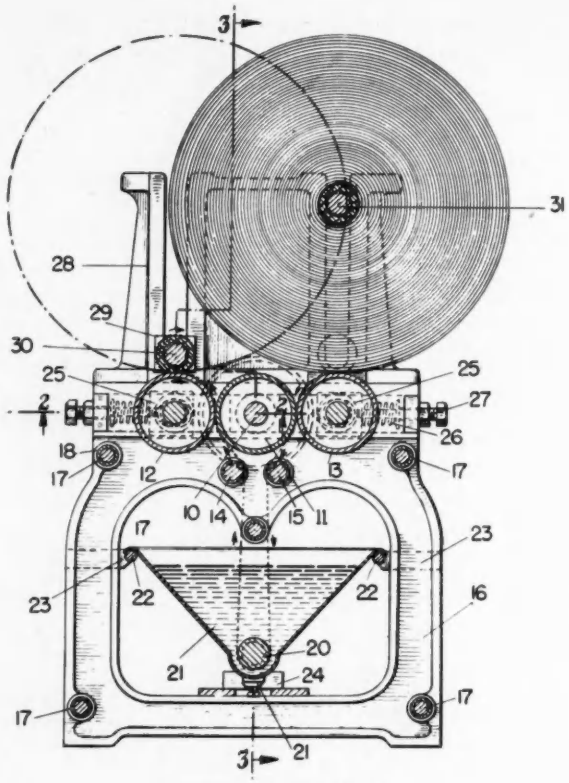


Figure 1—USP 2,513,209

BLEACHING TEXTILES—Hypochlorite plus Chlorite—Steam Aftertreatment B, 1

U S Pat 2,521,340

(Mathieson Chemical Corporation—Carr—Sept 5, 1950)

Chlorites are relatively inactive as textile bleaching agents when applied in neutral or alkaline solutions, but it has been observed that they are highly activated in acid solutions or in the presence of sodium hypochlorite (see U S Pat 2,383,900, discussed below), which is known to reduce the tensile strength of cellulosic fibers when present in higher concentrations. However, for quite some time it has been suggested that mixtures of considerable amounts of sodium hypochlorite with sodium chlorite can be added without affecting the material. An aqueous solution containing both ingredients is used, in this case, at the ratio 1½ hypochlorite : 1 chlorite, the amounts based on the content of available chlorine. The optimum temperature is found to be somewhat less than 100°F since the hypochlorite component is rapidly decomposed above 100-110°F.

According to the present invention, higher temperatures may be used without premature decomposition of hypochlorite by first impregnating the fabric with a mixture as described above, then removing any surplus and finally steaming. The inventor points out that although he is aware that steaming of fabrics previously impregnated with bleaching liquids is generally known, this method has not been proposed hitherto for special hypochlorite-chlorite blends. A pretreatment with a caustic solution is suggested to which a small quantity of a wetting agent (alkyl-aryl sulfonate) is added, followed by steaming. These fabrics are subjected to the hypochlorite-chlorite impregnation, steamed, preferably in a J-box, washed, and dried.

References cited by the Patent Office, among others:

U S Pat 2,383,900 (1945—Mathieson Alkali Works): bleaching and scouring with an alkaline solution of chlorite, hypochlorite and detergent at temperatures not above 120°F and then raising the temperature to 200°F.

U S Pat 2,358,866 (1944—Mathieson Alkali Works): bleaching with combined solutions of (acid) chlorites and peroxide. (The latter represses the evolution of ClO_2.)

U S Pat 2,267,718 (1941—Du Pont): textile treatment in a J-box into which steam is introduced.

Brit P 561,834 (1944—Mathieson Alkali Works): applying a solution of chlorite mixed with hypochlorite.

Brit P 552,711 (1943—Mathieson Alkali Works): impregnating cellulosic fibers with chlorite, squeezing and steaming, preferably in the presence of a detergent.

PRINTING INDIGOSOLS—Modified Steam Developing Method D, 2, 04

U. S. Pat. 2,521,485

(General Aniline & Film Corp.—Schoen—Sept. 5, 1950)

One method of developing prints of sulfuric acid esters of leuco vat dyes (for example, the Indigosol dyes) consists of applying pastes containing an acid liberating agent, an oxydizing compound and oxidizing catalyst. This specification refers to U. S. Pat. 1,747,107, describing the aforementioned method. The acid liberating agent (called the "acid splitter") may be ammonium sulfate, thiocyanate or diethyltartrate; the oxydizing substance is chlorate; the generally used catalyst is ammonium vanadate. Certain Indigosol brands (for example, the dye derived from Jade Green) give poor results, probably because of too rapid a regeneration. This prevents full penetration of the dye. The present invention aims at inhibiting the oxydizing development in the first phase of the steaming operation (estimated at about 1-3 minutes) and then effecting the full acid oxidation in the second part of the steam treatment. The desired effect is brought about by replacing the conventional "acid splitter" by organic sulfur compounds, which are in themselves incapable of splitting salts or esters. Examples of these substances are: aldehyde bisulfites, aldehyde sulfoxylates, glyoxal bisulfite and similar substances. In addition, the pastes contain urea or an alkali-carbonate as stabilizing agents, chlorate as oxydizer and vanadate as a catalyst. It is assumed that the sulfur containing organic compound (e.g., Rongalite) is progressively oxylized to sodium bisulfate and in some cases even to sulfuric acid. This reaction may take place in the ager within the first three minutes; thereafter (in the remaining 2 minutes), the vat dyestuff is completely re-oxydized. The action of the formaldehyde bisulfite or aldehyde consists, therefore, in retarding the re-oxidation until the leuco-vat dye solution has had sufficient time to penetrate the surface layer of the fibers. In one of the examples the sulfuric acid ester of leuco Jade Green is incorporated into a paste containing urea, thiodiglycol, thickener, soda ash, sodium bromate, Rongalite C and vanadate.

References cited by the Patent Office, among others:

U. S. Pat. 2,389,245 (Sandoz—1945): printing sensitive Indigosols (especially Indigosol Green I B, I G G, etc.) by adding organic bases, such as alkanolamines, to the usual pastes containing chlorate, vanadate and diethyltartrate.

U. S. Pat. 2,182,964 (Celanese—1939): dyeing cellulose acetate with an organic solution of an Indigosol plus a reducing agent; aftertreating with dichromate and acid to develop the Indigosol to the corresponding vat dye.

CLOTH BLEACHING APPARATUS B, 4

U. S. Pat. 2,522,900

(Minneapolis Honeywell Regulator Co.—Schmitt —Sept. 14, 1950)

A cloth bleaching operation, preferably carried out by a peroxide treatment, is protected by this patent. The main object is to provide an automatically controlled impregnation in a saturator tank (3)—see Fig. 1—effected by regulating the moisture content at the entrance (rollers 8, 9) and at the outlet (rollers 10, 11) of the fabric by adjusting the pressure of these rollers. The following procedure, consisting of a steam heated J-box (4), washing rolls (5) and drying cans (6) is conventional, not forming part of this invention.

The complicated controlling system might best be understood by examining Fig. 2. Air is pumped by (16) through a three-way valve (19) to build up pressure in a chamber (28) which transmits compressed air by pipes (29) and (30) to the pressure chambers (23) and (23') respectively. These chambers are connected with the rollers (8, 9) and (10, 11). Air flows also from apparatus (28) through pipe (41), extending down to the tank (3) and beneath the surface level of the (peroxide) solution. This air maintains a pressure in the pipe (41) corresponding to the hydraulic pressure at the lower end (42) of pipe (41). The differences in pressure are transmitted to the two pressure chambers, (23) and (23'), which act on the pairs of rollers (8, 9) and (10, 11), increasing or decreasing the pressure of these rollers to maintain the moisture content of the liquid impregnated fabrics constant.

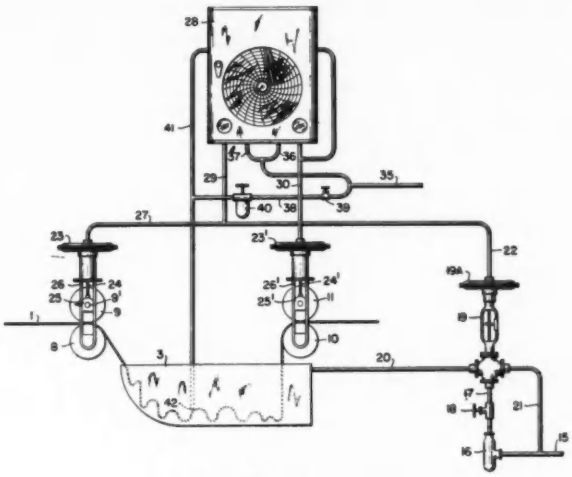


Figure 2—USP 2,522,900

References cited by the Patent Office, among others:

U. S. Pat. 2,382,726 (1945—Korte, et al.): apparatus for chlorinating bast fibers; impregnating piece goods with freshly prepared and supersaturated chlorine water and introducing chlorine gas to constantly replace the consumed gas. The container where the supersaturated chlorine liquid is prepared is combined with a closed system wherein the goods can repeatedly be impregnated and squeezed off alternately.

U. S. Pat. 2,334,066 (Du Pont—Campbell, et al.): padding the goods to be bleached in an alkaline hydrogen peroxide solution (pH = 8-12), passing a steam tube at about 212°F. with a 100% pick-up and storing for about 30 minutes in absence of liquid; additional heating is omitted in this phase.

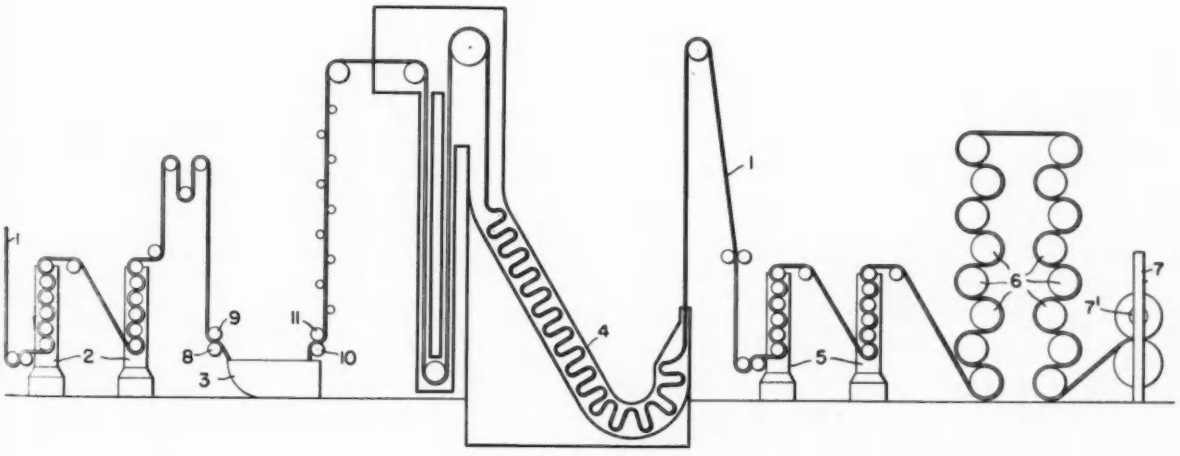


Figure 1—USP 2,522,900

ABSTRACTS

The Sorption of Acid Dyes on Nylon

F C McGrew and A K Schneider, *J Am Chem Soc* 72, 2547-52, June, 1950.

Much has been learned in recent years of the mechanisms by which the acid dyes are sorbed by the natural polyamides, wool and silk. It is generally agreed that salt linkages between the dye anions and the amine cations of the protein are formed in stoichiometric amounts and that the process of formation of these linkages constitutes much of the driving force for the penetration of dyes into the protein fiber. A close similarity between wool and a synthetic polyamide such as nylon in the sorption of dyes has been shown by several workers. They have postulated the sorption of acid dyes to take place by the same mechanism as on wool, with, in addition, a weaker bonding at low pH between the acidic dye and the weakly basic amide groupings of the polymer chain. Peters in particular has produced evidence to support these mechanisms. He has concluded that adsorption on amino end groupings accounts for dye sorption at pH values of about 3 and above, and that the recurring amide linkages are sufficiently basic to account for the very greatly increased adsorption at high acidity.

Evidence is presented in this paper to confirm the mechanism of attachment of acid dyes to nylon at moderate pH levels as consisting of a salt-type linkage between the basic amine ends of the polymer chain and the sulfonic acid groups of the dye. The quantitative measurement of affinity of dye for the fiber, previously applied to wool, has been successfully extended to nylon. The procedure has been modified to permit its application to dyes with high affinity. The affinities for nylon have been measured for ten representative acid dyes. The affinity has been shown to provide a quantitative basis for the explanation of competitive effects in the sorption of acid dyes by nylon from mixed solutions. —WHC

Equilibria in the Dyeing of Nylon with Acid Dyes

W R Remington and E K Gladding, *J Am Chem Soc* 72, 2553-9, June, 1950.

The objectives of the present investigation were to elucidate the mechanism of the combination of monobasic acid dyes with nylon under normal dyeing conditions and to apply the knowledge thereby obtained to an understanding of the phenomena which occur when nylon is degraded by the application of excessive amounts of dye from acid solutions.

Although nylon fiber has been available commercially for about ten years, relatively little quantitative information on its combination with acid dyes has been published. Stott investigated the practical aspects of the problem quite thoroughly and found that the saturation value of the fiber with respect to acid dyes was much less than that of wool. From this result, it seems probable that the dyeing mechanism directly involves the relatively few amino groups present in the nylon. Thus, the very low saturation value of nylon as compared with wool can be explained by the great difference in the amine contents of the two fibers.

On the other hand, other workers reported that when excess dye is available to the fiber the amount taken up increases indefinitely as the pH of the dyebath is lowered and that no saturation value exists.

The authors have investigated the nature of the degradation of nylon by the application of excessive amounts of acid dyes from solutions of low pH. They find that the absorption of dye in this manner is accompanied by the hydrolytic rupture of principally nonterminal amide groups with the consequent production of new amino groups, furnishing additional dyeing sites. These phenomena have been observed at pH's within the range of normal dyeing practice.

The experimental evidence supporting this conclusion is described in detail.—WHC

Zirconium Compounds and Water-Repellency

Anon, *Fibres* 11, 365, October, 1950.

A water-repellent finish on a fabric usually has as its gravest defect a nonpermanency to laundering or dry-cleaning, and any process which offers a way of increasing the fastness of such a finish is to be welcomed.

In a recent British patent (28829/1949) filed by the National Lead Company, employment is made of a water-soluble alkaline zirconium compound (e g, ammonium dicarbonato zirconylate) in which the zirconium is present in the anionic form. This substance is applied to cotton, mixed with a waxy or fatty material which will give the water-repellence (in an example, ammonium oleate and paraffin wax are mentioned), and the zirconium compound is said to adhere to the fibers and to bind a film of the fatty or waxy material. This film is then fixed on the fibers by an after-treatment with a water-soluble salt of a polyvalent metal (e g, basic zirconyl chloride).

Fabrics so treated are said to possess very strong and sustained water-repellence (equivalent to a spray-rating of 80-100), and are claimed to withstand eight launderings or six dry-cleanings before losing their water-repellency.—WHC

Rapid Methods of Scouring, Milling and Dyeing Wool

E I Noble, *Textile J Australia* 25, 806-8, 810-11, 852, October, 1950.

There is a limit to the extent of increasing the speed of scouring wool because of the time required for the dirt to be removed, the time taken to emulsify the wool grease, and the necessity of preventing felting. One method of increasing the scouring rate is by the use of synthetic detergents and common salt, particularly in the middle bowls, on the grounds that synthetic detergents are more easily rinsed out of the wool than soap solutions.

Synthetic detergents, being neutral, have another advantage: the author refers to work recently published, which shows clearly that carbonate of soda and other alkaline detergents cause the fiber to lose 40 per cent of its elasticity or even 60 per cent during severe washing; ammonium carbonate or potassium carbonate give less damage than soda ash, ammonia or soap, but all alkaline detergents are injurious.

In scouring loose wool with synthetic detergents, results in the past have sometimes been disappointing as a result of insufficient detergent being used and the failure to add sufficient common salt, which enormously improves the scouring ability of all the synthetic detergents such as sulfated fatty alcohols, secondary alkyl sulfates, alkaryl sulfonates and alkyl phenol-ethylene oxide condensates.

The author gives much information on the operations of scouring loose wool and woolen piece goods. He compares alkaline and acid milling, and suggests that where the usual acids (sulfuric, acetic and formic) give trouble by depositing iron or copper stains on the cloth, due to iron or brass fittings in the milling

machine, the trouble can be avoided by substituting phosphoric acid.

The author also discusses the scouring of worsted piece goods, and in closing, refers briefly to several new processes for dyeing wool.—WHC

Physics of Fibers: Methods of X-Ray and Microscopic Study; Swelling Action

W R Moore, Dyer 104, 366-7, October-November, 1950.

Structure of Fibers.—Long chains alone do not give fibrous structure and properties; the chains must be arranged in a particular way. Fiber structure is, therefore, based on chain arrangement, and is studied by X-ray methods, sorption and swelling measurements, density measurements and by determination of birefringence and double-refraction.

X-ray examination is based on reflection by regularly occurring planes of chemical groupings in fibers in which the long molecules are in certain regions arranged in bundles. Only part of the chains are so arranged, the others being in a random kinked fashion. The orderly part is the crystalline region, and the disorderly part, the amorphous region. Treatments such as mercerization or stretching may alter the crystallinity.

X-ray observation on protein fibers allows to be followed such processes as steaming, involving the breaking of cystine bonds, salt-bridges and hydrogen bonding, so allowing the unfolding of the folded chains, and the change of α into β-keratin. Silk is shown to have no folded structure, and so can stretch only by chains slipping past each other, and so has only small extensibility even on wetting. In nylon there is strong hydrogen-bonding between amide groups of adjacent chains, explaining its extreme insolubility, great strength and little extensibility on wetting. Stretched nylon gives a good X-ray diagram, showing high degree of crystallinity.

Silk has more polar groups than nylon, and has a higher regain partly due to this. Wool again has more polar groups than silk with a similar higher regain. Ramie, cotton and viscose are equivalent chemically, have the same groups for attachment, but differ in regain. Hence the physical structure of these fibers controls the moisture absorptive capacity. Water is found to be taken up only in the amorphous regions, therefore regain varies with degree of crystallinity. Stretched viscose is found to have a smaller sorption ratio than normal viscose—hence, a higher degree of crystallinity.

The author also discusses swelling of fibers and the various theories as to swelling action; microscopic examination of fibers; and the use of the electron microscope.—WHC

NEWS

Ernest D Gossweiler

• Sandoz' President Dies Suddenly

Ernest D Gossweiler, President and Director of Sandoz Chemical Works, Inc, died suddenly on February 1st in his office at 61 Van Dam Street, New York City. He was 62.

After working for Sandoz Ltd in England and Switzerland, Mr Gossweiler founded the American firm in 1919, the year he came to the United States from Basle, Switzerland. Under his leadership, Sandoz has become one of America's largest dyestuff manufacturers.

Mr Gossweiler was a Director of Cincinnati Chemical Works, Inc, and President and Director of Sandoz Chemical Works, Ltd, of Toronto and Sandoz Pharmaceuticals in Montreal.

Surviving are his widow, Rose; a son, Max, of Larchmont, N Y; a daughter, Mrs James Hand of Ossining, N Y, and a brother, Carlo Gossweiler of Genoa, Italy.

• One-pass, Electric Heat Finishing Process for Tricot

A one-step electric heat process for finishing tricot, known as the "Leeset" Process, and electronic control are currently being employed by the Lee Dyeing Company, Johnstown, N Y, to assure even heat application to the length and width of the goods during the process. The goods are dyed prior to setting.

Ralph Evans, president, points out that the continuous, single-run operation helps reduce damages and assures even, high quality. 200 fabric numbers are being handled, including nylon men's shirting in volume.

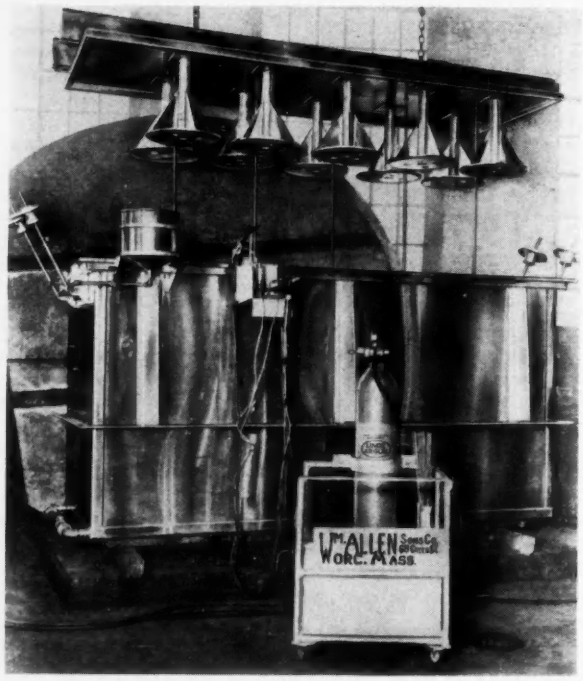
• Dyeing by Light Demonstrated

At a recent demonstration sponsored by the Chicago Association of Commerce and Industry, a new process for dyeing fabrics with light was demonstrated. Alston Rodgers, senior lighting engineer, General Electric Lighting Institute, and chairman of the committee of progress, Illuminating Engineering Society, was chief speaker. Details of the method have not been disclosed.

• Solvay to Increase Soda Ash Production

A 200,000 net tons per year expansion of soda ash production by The Solvay Process Division, Allied Chemical & Dye Corporation, has been projected in an application for Necessity Certificate filed in Washington. The contemplated expansion would be made at Solvay's Baton Rouge, Louisiana plant.

Estimated time to complete the expansion would be 18 months to two years from the date of issuance of the Necessity Certificate, depending upon availability of materials necessary for construction.



Stainless steel dye vat fabricated by Heliarc welding

• Lower Cost Fabrication of Dye Vats

Heliarc welding, requiring no flux, is currently being used at William Allen Son's Company, Worcester, Mass to finish stainless steel dye vats at lower cost and without distortion. The welds are reported to be of high quality and free of spatter. Welding speed is rapid and, it is stated, no grinding is required since the welds are smooth enough "as welded."

As can be seen in the above photograph, the top compression spray units are suspended above. A unique feature of the portable welding equipment, hung on the side of the dye vat, is the Oxweld V-30 Shut-Off Valve. When the welding torch is hung on the support hook, the flow of both argon and the cooling water to the torch are automatically stopped. Heliarc welding equipment is marketed by Linde Air Products Division, Union Carbide and Carbon Corporation.

• Work on Standards to be Featured at March Meeting of ASTM Committee D-12

Several technical papers and intensive work on standard specifications and test methods are on the agenda of Committee D-12 on Soaps and Other Detergents at its meetings on March 19 and 20 at the Hotel Park Sheraton, New York, This technical committee of the American Society for Testing Materials usually holds only one intensive series of meetings a year. Some of the papers to be presented follow:

(a) *Laboratory Performance Test for Detergents Used in Continuous Scouring of Raw Wool*

(b) *A Method of Measuring the Adsorption of Anion Active Agents on Materials Commonly Washed*

(c) *A Film on the Mechanical Effect Produced in Launder-Ometer Jars*

(d) *The Use of Radioactive Tracers in the Evaluation of Metal Cleaners*

Prior to the main meeting of the committee on March 20 there will be sessions of the various subcommittees, arranged according to three main classifications:

(1) *Methods of Testing*—The analysis of soap, synthetic detergents, dry cleaning materials, alkaline detergents, metal cleaners and physical testing.

(2) *Specifications*—Soaps, synthetic detergents, dry cleaning, and alkaline detergents.

(3) *General or Miscellaneous Subjects*—Work on nomenclature and definitions.

The subcommittee on physical testing will hold a round-table discussion on the various wetting evaluation methods.

Committee D-12 has issued some 35 standard specifications and test methods, and a number of proposed methods have been published to elicit criticism. In the latter category are tests for pH of Aqueous Solutions of Soaps and Detergents and for Foaming Properties of Surface-Active Agents.

New tentative specifications issued in 1950 cover Chip or Granular Soap and Solid Soap for Low-Temperature Washing, Low and Medium Titer (ASTM D 1111 and D 1112, respectively).

A detailed schedule of the meetings can be procured by writing to the Secretary of Committee D-12: H R Suter, Wyandotte Chemicals Corp, Wyandotte, Mich. J C Harris, Monsanto Chemical Co, Dayton, Ohio is Chairman, and Frederick Krassner, U S Naval Supply Depot, Brooklyn, N Y is Vice-Chairman.

• McElroy Reelected AASGP Head

Neil H McElroy, Procter & Gamble Co, was reelected president of the Association of American Soap & Glycerine Producers, Inc, at their recent 24th annual convention.

All other officers also were reelected with the exception of vice-president for the East. Directors will fill the post at a later date.

E W Wilson, Armour & Co, continues as Midwest vice-president; E M Finehout, Los Angeles Soap Co, Far West vice-president; Nils S Dahl, J T Stanley Co, treasurer, and Henry F Elberfeld, Colgate, assistant treasurer. Roy W Peet, association manager, continues as secretary.

New directors elected include: E W Wilson, Armour & Co, Chicago; E H Little, Colgate-Palmolive-Peet Co, Jersey City, N J; A W Schubert, Emery Industries Inc, Cincinnati; E J Sella, Great Stuff Products Co, West New York, N J; J J Babb, Lever Bros Co, New York; E M Finehout, Los Angeles Soap Co, Los Angeles; E M Maxwell, National Aniline Division, Allied Chemical & Dye Corp, New York; A G Peck, Pecks Products Co, Cincinnati; G C Perkins, Perkins Soap Co, Springfield, Mass; N H McElroy, Procter & Gamble Co, Cincinnati; N S Dahl, J T Stanley Co, New York; E A Moss, Swift & Co, Chicago; S Humphreys, Tennessee Soap Co, Memphis; J W Oppenheimer, West Disinfecting Co, Long Island City, N Y, and G A Wrisley, Allen B Wrisley Co, Chicago.

A W Schubert, of Emery Industries, Inc, Cincinnati, was chosen to be the new chairman of the Glycerine Division, and Clyde Oliver, of Lever Bros, New York, vice-chairman.

Mr Schubert succeeds N N Dalton, long association advisor on glycerine, who asked to be relieved of the work associated with the chairmanship.

• Carbide and Carbon Establishes Fellowship

Carbide and Carbon Chemicals Division of Union Carbide and Carbon Corporation has established a Participating Fellowship at Textile Research Institute to be known as the Carbide and Carbon Chemicals Fellowship. The subject of the research will be a study of the basic triboelectric properties of textile fiber materials as they relate to the important problem of static generation in processing and service. William P Riemen, who received his BS degree in physical chemistry from the University of Wisconsin in 1950, will undertake the work of the Fellowship, which will constitute his PhD thesis research at the Institute and Princeton University. Dr Donald J Montgomery, Institute physicist, will be thesis advisor for the Carbide and Carbon Chemicals Fellowship.

• Thomas Elected to Presidency of Plastics Engineers Society

A new slate of officers, headed by Islyn Thomas as president, was elected by the National Council of the Society of Plastics Engineers, Inc at their recent three-day meeting (January 18-20) at the Hotel Statler, New York.

The elections took place during the Society's Seventh Annual Technical Conference and the results were announced at the luncheon and business meeting, held the first day.

Mr Thomas, president of the Thomas Manufacturing Corporation of Newark, N J, is a member of the Newark Section of the SPE.

Other national officers elected are as follows:

Vice-president — Walter O Bracken, Hercules Powder Company, Wilmington, Del.

Secretary—Walter F Oelman, Standard Molding Corp, Dayton, Ohio.

Treasurer—William J Dunnican, Synvar Corporation, Wilmington, Del.

• Technical Advisers For Print Institute

A technical committee has been set up to advise The Silk & Rayon Print Institute on all technical matters concerning the production of silk and rayon prints, according to C E Murray, President.

Members of the new committee are Morris Blackman of Allied Textile Printers, Inc; Milton Emerson of United Piece Dye Works, and Byron Lear of Waldrich Co.

Another new member (Wullschleger & Co) has joined the Institute, bringing the total membership up to 77 to date.

• New Consulting Service Offered

A consulting service for the design, analysis and interpretation of experiments on laboratory, pilot plant and full production scales has been announced by Experimetrics, Inc, Station I, Buffalo 22, N Y. Also offered are correlation analysis and quality control. Company aims are "to foster widespread adoption of these techniques in the process industries." Free booklet on request—(see "Technical Literature" Section).

• TRI Board Policy on Participating Fellowships Defined

As a result of numerous inquiries the Board of Directors of the Textile Research Institute, on December 7, 1950 set up a policy governing Participating Fellowships*, the essential features of which follow:

(1) The Fellowship donor may be:
   a. A T R I company member
   b. A nonmember company through an employee who is an individual member of T R I
   c. Any individual
   d. A trust
   e. A trade association

(2) Field of research may be specified by the donor but must be acceptable to T R I (decision to be made by Director of Research).

(3) Research problem must be suitable for thesis assignment.

(4) Research results must be publishable.

(5) Any patents resulting from the work will be handled according to T R I policy.

(6) Sponsor may attach name to Fellowship.

(7) Donor firm has complete freedom of consultation with Fellow at all times but traveling expenses of Fellow or representative of donor must be paid by donor.

(8) Types of students who may be Participating Fellows:
   a. Pre-doctoral Fellow (usually after first year of study)
   b. Post-doctoral Fellow
   c. Research Refresher Fellow

(9) Cost of Participating Fellowship to donor—$5,000 per year, plus special equipment, plus travel.

(10) Minimum period of sponsorship—2 years.

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* The term Participating is used to indicate that the donor has the opportunity of having work done in the field of his primary interest, providing his request is consistent with the program of Fundamental Textile Research of the Institute.

• FIT Wool Exhibit Opened to Public

Under the auspices of the Wool Bureau, Inc, an exhibit stressing new cloud light fabrics which extend wool's fashion life through four seasons has been opened to the public on Mondays (1 to 4) by the Fashion Institute of Technology. Included in the exhibit is a collection of Spring and Summer weight menswear fabrics, as well as a display depicting the processing of wool.

• ATSMPP Names 6 Working Committees

Ernest A Gsell, president of the Association of Textile Screen Makers, Printers and Processors, Inc, has appointed members of six working committees. One committee, on national emergency, is set to operate on price controls, war contracts and chemical allocations. Their initial work will cover uniform contract, registration of customers and screens, and grievances.

Following is a list of committee members:

National Emergency: Max Jacobs, chairman, New York Textile Prints Corp; Maxwell J Blum, Blum Screen Print Co; Albert Cluzel, Tavernon Photo Engraving Co; William Kay, City Screenprint Corp; Henry Lutkowski, Loyal Screen Print Co, and Alexis Thomas, Modern Steaming & Washing Co, Inc.

Industry Practices: Louis J Blum, chairman, Blum Screen Print Co; Jack Brafman, Ranel Finishers; F W Hamm, Printex Corp of America; Max Jacobs, Murray Kalman, Finetex Screen Print Corp; Harry Kaplan, Davar Textile Printing Co, Inc; Robert Lolol, Perfect Textile Printing; Frank Marino, European Screen Printing Corp; Jerry Ruiz, Central Textile Screen Studios, and Kegan Yezdanian, U S Textile Screen Engraving Corp.

Labor Relations: David Schneider, chairman, City Screenprint Corp; Mr Cluzel; John D'Amico, Loyal Screen Print Co; Max Jacobs, Joseph Newman, Plaza Screenprinting Corp, and Mr. Yezdanian.

Research and Technical Development: Mr. Yezdanian, chairman; Edward Carlon, Apex Screen Engraving Co; Herman Figowy, Empire Screen Printing Co, Inc; F F Jacobs, Ciba Co, Inc; Max Jacobs and Harry Roth, Roth Studios.

Membership: Mr. Cluzel, chairman; Louis J Blum; Mr Figowy; Mr Hamm; Max Jacobs; Mr Kalman; Mr Kaplan; Isidore Perlmutter, Ranel Finishers; Harold Straus, Atlantic Textile Printing Co; Mr Roth; Mr Yezdanian, and Harry Zarin, Mercury Screen Print Co, Inc.

Public Relations: Rena Kauffman, chairman, Renee Screen Studio; Mr Lodol; Mr Straus and Mr Zarin.

• Poor Reelected to NAFTF Presidency

The entire 1950 slate of officers of the National Association of Finishers of Textile Fabrics, headed by Arthur G Poor of Standard Bleachery and Printing Co, was reelected at the 37th annual meeting of the organization last month at New York's Hotel Statler. The slate, including Mr Poor consists of G D Harrison, Lewiston Division, Pepperell Manufacutring Co, Lewiston, Me, as board chairman; S M Cone, Jr, Cone Finishing Co, Greensboro, N C, and W R Howell, Bradford Dyeing Association, as vice-presidents, and Miss Alice C Moore, secretary and treasurer.

Elected to the executive committee for three-year terms expiring in January, 1954, were: J K Milliken, Mt Hope Finishing Co, North Dighton, Mass; C B Hayes, Pacific Mills, Lyman, S C, and A L Garfinkel, Lowell Bleachery, Inc, St Louis, Mo.

Chosen to the executive group for one-year terms expiring next January were: E F Farrell, Mansfield Bleachery, Mansfield, Mass; Mr Harrison; Robert Amory, Springs Mills, Inc, Lancaster, S C; J M Cole, Cold Spring Bleachery, Yardley, Pa; N B Durfee, Lincoln Bleachery & Dye Works, Lonsdale, R I; W O Forssell, Slatersville Finishing Co (Walpole, Mass), Slatersville, R I; A O Joslin, Rock Hill Printing & Finishing Co, Rock Hill, S C; Lawrence Marx, Jr, Clearwater Finishing Co, Clearwater, S C; A G Odell, Kerr Bleaching & Finishing Works, Concord, N C; Julian Robertson, North Carolina Finishing Co, Salisbury, N C; J A Simmons, Lanett Bleachery & Dye Works, West Point, Ga; B I Ward, Bellman Brook Bleachery, Fairview, N J, and R W Ward, Providence Dyeing, Bleaching & Calendering Co, Providence, R I.

In addition to the above, the following members of the executive committee continue to serve unexpired terms, as follows:

Until January, 1952: T A Adams, U S Finishing Co, Norwich, Conn; W R MacIntyre, Jos Bancroft & Sons Co, Wilmington, Del, and G E Sinkinson, Sayles Finishing Plants, Inc, Saylesville, R I.

Until January, 1953: William Berry, Riegel Textile Corp, New York; W A Broadfoot, The Aspinook Corp, Jewett City, Conn, and H M Burke, Dutchess Bleachery, Lockwood-Dutchess, Inc, Wappingers Falls, N Y.

• Eight Exhibit at F-D Symposium

Eight exhibits provided background for the remarks of four outstanding figures in the synthetic fibers field at Fairleigh Dickinson College's annual textile symposium last month. They included Toscony Fabrics, Inc, Passaic, N J (vinyl prints, garments); E I du Pont de Nemours & Co, Inc, Wilmington, Del (fibers, yarns, fabrics and dresses); Owens-Corning Fiberglas Corp, New York, N Y; Textile Decorative Division (decorative glass textiles); Carbide & Carbon Chemicals Division, Union Carbide & Carbon Corporation, New York, N Y (dynel fibers, yarns and fabrics); Virginia-Carolina Chemical Corp, Richmond, Va (Vicara fibers, blended fabrics and clothing); United Piece Dye Works, Lodi, N J (synthetic prints and piece dyes); Waldrich Company, Delawanna, N J (Army camouflage cloths and prints); and Texstyle Corporation, Clifton, N J (discharge prints).

Speakers in addition to Dr Peter Sammartino, president of the college, and H R Mauersberger, head of the college's textile institute, included Dr J B Quig, manager of the Development Section, Rayon Technical Division, E I du Pont de Nemours & Co, Inc who spoke on "Du Pont's Newer Fibers"; R K Kennedy of the Carbide & Carbon Chemicals Division whose topic was "Dynel, the New Acrylic Fiber"; Jesse F Yeates, Jr of Virginia Carolina Chemical Corporation's Sales Department, who spoke on "Vicara, the Fiber that Improves the Blend"; and William Colten, Manager of Owens-Corning Fiberglas Corporation's Decorative Textile Division, whose talk was "For Beauty and Performance, It's 'Fiberglas'."

• NETF Grants $125,000 Additional Funds

In addition to an earlier 1950 grant of $48,000 in scholarships previously noted, the New England Textile Foundation Executive Committee has voted to grant $78,000 for the following purposes:—

For Bradford Durfee Technical Institute—$2,000.00 for augmentation of faculty salaries and $6500.00 for the purchase of new equipment.

For Lowell Textile Institute—$12,000.00 for augmentation of faculty salaries and $27,000.00 for the purchase of new equipment.

For New Bedford Textile Institute—$5,500.00 for purchase of new equipment.

For Textile School of R I School of Design—$14,000.00 for augmentation of faculty salaries and $10,000.00 for purchase of new equipment.

It is reported that the Foundation had to go into its reserves in order to finance the 1950 expenditures since contributions received from the textile and related industries were only slightly more than $107,000 (out of which come the operating expenses of the NETF).

• U S Testing Establishes Dallas Laboratory

A new cotton fiber testing laboratory in the Cotton Exchange Building in Dallas, Texas, the first independent commercial laboratory of its kind in the Lone Star State, has been established by the United States Testing Company.

This is the second such establishment by the company, the first being opened in Memphis in 1949.

The new laboratory is maintained at standard atmospheric conditions. Its equipment includes the latest type Pressley Testers for fiber strength, the Fibrograph for fiber length uniformity, the Micronaire for fiber fineness, and microscopic equipment for cell wall thickness or maturity.

• Chemical Engineers to Sponsor New Award

This year for the first time the Chemical Engineers of Greater New York will present an annual award to an outstanding young chemical engineer in the New York area. This is being established to create a nonmonetary recognition for exceptional service to humanity or to recognize outstanding professional achievements early in the professional career.

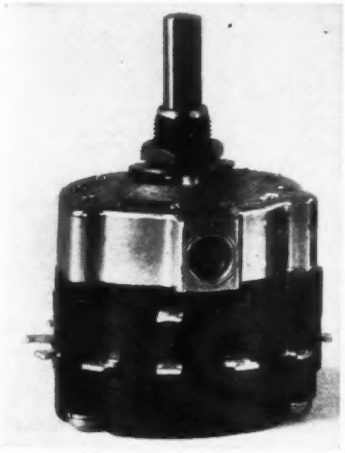
The award will be made to a chemical engineer, 32 years of age or under, who has shown outstanding professional ability and service to humanity. Any young chemical engineer working within the geographic area of the society is eligible. Equal consideration will be given to chemical engineers working in research and development, production, sales, and other fields.

Nominations for the award are invited from all manufacturers, research laboratories, colleges and universities, professional groups, and trade organizations in this area. The sponsoring society is anxious not to miss any qualified candidate for the award. Any individual who wishes to make a nomination may do so by securing an application from Sidney D Kirkpatrick, McGraw-Hill Publishing Company, 330 West 42nd Street, New York, New York, Chairman of the Board of Judges.

Other members of the judging committee are: Dr H B H Cooper, Calco Chemical Division, American Cyanamid Company; Zola G Deutsch, Consultant; Dr Donald F Othmer, Polytechnic Institute of Brooklyn; Robert L Taylor, Manufacturing Chemists Association, Inc; and Dr Wm Bowman, Jefferson Chemical Company. Other members will be announced at a later date.

Closing date for nominations is April 30, 1951.

NEW PRODUCTS



L & N Selector Switch

• Rotary Selector Switch

Leeds & Northrup Company, 4934 Stenton Avenue, Philadelphia 44, Pa announces a new rotary selector switch with solid silver contacts and enclosed construction for use in instrument circuits. Contact resistance is reported about 0.001 ohm with less change than 0.0005 ohm on life tests of 10,000,000 operations.

Brushes are multiple-leaf, self-aligning, made of durable silver alloy and the electrical stray is reported exceptionally low. Current capacity is listed as one ampere at 110 volts, 60 cycles on resistance load.

An adjustable detent permits variation of the switching torque. Thermal emf when the switch is operated at normal speed is less than one microvolt. Combinations ranging from single-pole 12-position to 6-pole 12-position for switching are supplied.

• New GDC Dyestuffs

The following are new products of the General Dyestuff Corporation. Figures in parentheses after each product name indicate the numbers of the descriptive bulletins:

CELLITON DISCHARGE BLUE 5GA (G-646)—a new dyestuff for acetate (estron) and nylon, which dyes bright greenish-blue shades. This product is said to possess "the unique property, among bright greenish blues, of being dischargeable to an excellent white. Other dischargeable acetate blues are much redder and duller. By the use of Celliton Discharge Blue 5GA, either alone or shaded to the yellow side with Celliton Yellow 5GA, there is made available for discharge a range of shades from turquoise, aquamarine, and peacock blue through aqua green, nile green and primitive green all the way to chartreuse, with a brightness claimed to be not previously attainable. The enlarged scope of bright dischargeable green-blue and green grounds for acetate fabrics points to the product's use for fancy necktie and dress goods. As a color that exhausts best at relatively high temperature, it is said to be especially suitable for application to soft fabrics that dye best on the reel, such as romaines, crepes, shantungs, and jerseys.

* * *

ALGOSOL GOLDEN ORANGE IRR-CF (G-651)—a water- soluble leuco ester of the straight anthraquinone vat dyestuff Indanthrene Orange RRT. This Algosol reportedly can be either printed or dyed to give fairly bright, reddish-orange shades of good tinctorial value, which are much yellower than those obtained with Algosol Brilliant Orange IRKL, and also much yellower and at the same time much faster to light than those obtained with Algosol Orange HR-CF. The fastness properties of prints and dyeings of this product on all fibers are said to be in general very good or excellent.

Application may be made by either dyeing or printing to cotton, linen, rayon, wool, silk or mixtures of any of these fibers.

* * *

ALGOSOL GREY IHL-CF (G-658)—a water-soluble dyestuff of the leuco-ester type in powder form, suitable for dyeing and printing cotton and rayon. GDC recommends its use wherever grey shades with the very best fastness to light are required, such as for draperies and upholstery fabrics. Besides excellent (7) fastness to light, this grey is said to give very good to excellent (4-5) fastness to washing and excellent (5) fastness to chlorine, making it useful also for table cloths, shirtings and washable dress goods, where fastness to repeated laundering is important. The grey shades produced are toward the reddish-blue side, being considerably redder and duller than those obtained with Algosol Grey IBL. At the same time the fastness to light of the IHL brand on cellulosic fibers is better than that of the IBL brand.

Algosol Grey IHL-CF reportedly can be printed on cotton, rayon or linen by either machine or hand-printing methods to give greys that are much faster to light than the corresponding grey shades produced with Rapidogen Blacks cut to grey. As for application to cellulosic fibers by dyeing, reports state that this dyestuff can be dyed in various equipment including continuous ranges, circulating machines, skein-dyeing machines, dye becks and jigs. Important significance is attached to its continuous application for solid grey shades on cotton-rayon materials by padding.

Since Algosol Grey IHL-CF is easily resisted it is suitable for resist padding. Its fastness of dyeings to caustic soda gives suitability for plissé effects and also for goods that are to be mercerized after dyeing. Relative freedom from copper and manganese (CF brand) permits its use on goods that are to be rubberized.

* * *

CELLITON FAST RED GGA EXTRA CONC CF (G-661)—a straight dyestuff used for dyeing bright reds of very good tinctorial value on acetate (estron), and also on nylon. These shades of red on acetate are said to be much yellower than those from Celliton Fast Rubine BA-CF and considerably bluer than those from Celliton Scarlet BA Extra. Very good to excellent fastness to light for full shades (6-7), very good (4) fastness to atmospheric fading on acetate, excellent (5) dischargeability and excellent (5) fastness to sublimation give this dyestuff a wide range of use from fancy dress fabrics and linings to the principal component of reds for flags where excellent fastness to light, excellent fastness to sublimation and adequate fastness to water are essential.

The product is a well-dispersed, non-tarring brand, which is said to possess good affinity at both low and high temperatures. It reportedly gives excellent dyeing results in either jig or reel and on textiles containing filamentous fibers, staple fibers, or blends of different fibers.

The shades produced by Celliton Fast Red GGA Extra Conc CF are much bluer on nylon than on acetate. The fastness properties on nylon are said to be the same as on acetate, except that on nylon the fastness to gas fading is better. This particular red has received favorable reception by nylon-hosiery dyers as a shading color because it dyes yarns of different deniers and constructions so uniformly.

For the production of similar red shades on acetate and nylon in printing, the chemically identical Celliton Fast Red GGA Extra Conc CF for Printing is recommended by GDC.

* * *

CELLITON FAST RED GGA EXTRA CONC CF FOR PRINTING (G-666)—a straight dispersed dyestuff especially prepared in its physical properties for printing acetate and also nylon fabrics. It is said to yield cherry reds of very good tinctorial value, which are much yellower than those from Celliton Fast Rubine BA-CF for Printing and considerably bluer than those from Celliton Scarlet BA for Printing. Very good to excellent (6-7) fastness to light for full shades, very good (4) fastness to atmospheric fading on acetate and excellent (5) fastness to sublimation reportedly give this dyestuff a wide range of usefulness from fancy necktie and dress fabrics to bathing suits or draperies. The shades of this dyestuff on nylon are much bluer than on acetate. The fastness properties on nylon are virtually the same as on acetate.

• Emersol 212 Elaine

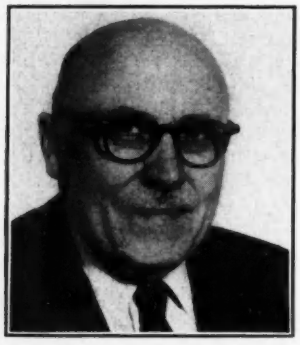
Emery Industries, Inc has announced the emergency expansion of oleic acid production to meet increased trade demand and government requirements in the form of a new single-distilled product, Emersol 212 Elaine. This product is reported similar in all respects to Emersol 210 Elaine, except for a 4.0 maximum unsaponifiable and a 96% minimum free fatty acid content for Emersol 212 as compared to a 2.5 maximum unsaponifiable and a 97% minimum free fatty acid content for Emersol 210.

This deviation from normal quality will have only minor effect on many finished products, the manufacturer states, but they recommend the product for these cases and where availability is paramount.

The expanded production of Emersol 212 Elaine supplements the production of regular single-distilled grades (Emersols 210, 211) the regular high-quality double-distilled grades (Emersols 220, 221) and of the premium-quality Emersol 233LL Elaine.

Samples of Emersol 212 Elaine are available upon request from Emery Industries, Inc, Department 5, Carew Tower, Cincinnati 2, Ohio, or from the company's branch offices.

PERSONNEL



Leonard S Little

LEONARD S LITTLE, Chairman of both the Executive Committee on Research and the General Research Committee of the AATCC, retired January 31 as manager of the Textile Service Section, Organic Chemicals Department, E I du Pont de Nemours & Co, Inc, under the company's retirement policy. This will in no way affect his association activities, he declares, and he will open offices as a chemical-textile consultant at Room 1500, 101 W 31st St, New York, with the Better Fabrics Testing Bureau. Part of his time will still be devoted to du Pont.

It is reported that AMBROSE R CHANTLER, special advisor on sales to the Organic Chemicals Department will direct the activities of the Textile Service Section from Wilmington.

Following his graduation as a chemistry major from Brown University in 1907, Mr Little began his long career in the dyeing, finishing and related chemical industries with the following companies in various capacities: Apponaug Company (chief chemist and dyer); Narragansett Chemical Co (president); U S Finishing Co, Pawtucket (superintendent); Pacific Mills Print Works Division, Lawrence, Mass (assistant manager); Lyman, S C Division of Pacific Mills (general manager to 1927); Joseph Bancroft & Sons Co (manager); Slatersville Finishing Company, Division of Kendall Mills (vice-president and general manager to 1933). In 1933 he became president and board chairman of U S Finishing and its subsidiaries. Following the short existence of the Amalgamated Dyestuff & Chemical Co, Mr Little joined du Pont.

Aside from his AATCC activities, Mr Little is a representative of chemical manufacturers making water repellents, chairman of the advisory committee to the Federal Trade Commission on water repellency, a governor of the AATT, and a collaborator of the Southern Regional Research Laboratory of the U S Dept of Agriculture. He also holds membership in the American Chemical Society, the ASTM, the SOCMA, the National Cotton Manufacturers Association, the Textile Research Institute, the Textile Institute and the Society of Dyers and Colourists.

R W HOOKER, Vice-President in Charge of Sales of the Hooker Electrochemical Company was re-elected President of The Chlorine Institute, Inc at its annual meeting in New York, January 24. On January 22, he was elected First Vice-President of the Compressed Gas Association, Inc at its annual meeting, also in New York. Mr Hooker has been a director of the Chlorine Institute since 1940 and prior to his first election to its presidency in 1949, had been a Vice-President of the Institute. He has been associated with the chlorine industry for many years as an official of the Hooker Company, one of the country's large producers of liquid chlorine and chlorinated chemical products.

Diamond Alkali Company has a new vice-president in A L GEISINGER, following action by the board of governors. In his new role, Mr Geisinger will have charge of the company's activity in the organic chemical field. At present he is president of the Martin Dennis Company, Newark (N J), chrome manufacturers, acquired by Diamond in 1948. Mr Geisinger joined DAC at its Pittsburgh headquarters in 1919.

JOHN N GAMMON has been appointed Southern district manager for Nopco Chemical Co of Harrison, N J, it is made known by G D Davis, vice-president in charge of industrial sales.

Mr Gammon replaces the late GEORGE H SMALL and will be in charge of the field force in the South handling chemical specialties of Nopco and Metasap Chemical Co, its subsidiary. He has been with the company since 1931.

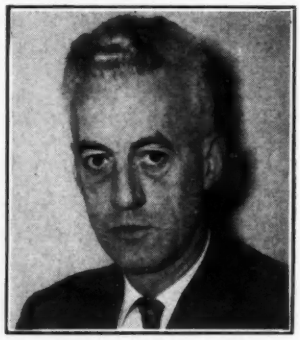
TRAVIS V RANKIN becomes manager of the Midwestern central district succeeding Mr Gammon. He joined Nopco in 1936.

RUSSELL F GAGNIER, 2½ years with the company in the Laboratory and Sales Development Division, has become a member of Nopco's New England sales force, succeeding C A MUGFORD in the Connecticut-Massachusetts section. Mr. Gagnier will work directly under HAROLD J WALDRON, New England district manager. Mr Mugford has retired after 22 years with the company to open the Southland apartment-motel in Sarasota, Fla.

L J HADOBAS will handle direct sales and technical service coverage of the West Coast area for Emery Industries, Inc's complete line of chemical products including stearic acids, oleic acids, other fatty acids, Plastolein plasticizers, Twitchell textile oils and soluble oil bases.

Mr Hadobas will operate out of a newly established branch office located in San Francisco, California. He has been associated with the Emery Chemical Sales Department for the past several years.

WILLIAM H STEWART, Greensboro, N C, has been appointed Purchasing Agent of the General Aniline Works Division of General Aniline & Film Corporation, according to an announcement by Chandler T White, Corporation Vice President in charge of the Division. Mr Stewart has been active as an executive in the purchasing field for more than 20 years.



William H Stewart

Minot Milliken

MINOT MILLIKEN, vice-president of Deering, Milliken & Company, Inc, has accepted the chairmanship of the woolens, worsteds and fabrics group for the 1951 Red Cross fund campaign of Greater New York.

EDGAR H BETTS was elected chairman of the board of W & L E Gurley, Troy, N Y, 106-year-old manufacturer of engineering and surveying instruments, last month at a meeting of the board of directors in Troy.

CHARLES A SMART was re-elected to a new term as president at the meeting and ROBERT GURLEY BETTS, former treasurer, was elected vice-president and treasurer. His father, the new board chairman, had served as vice-president prior to his election. LESTER C HIGBEE, general sales manager and director of engineering, retains the position of secretary.

At an earlier meeting of the Gurley stockholders the following men as well as those mentioned above were elected to the board of directors: DR ROLAND F BEERS, LOUIS H GROSS, ARTHUR L NASH, LOOMIS PATRICK and NICHOLAS WILLIAMSON.

The Board of Directors of the Hooker Electrochemical Company has elected EDWIN R BARTLETT to Chairman of the Board of Directors. R LINDLEY MURRAY was at the same time promoted to the office of president of the company.

Mr Bartlett, president of the firm since 1945, has been associated with the Hooker Company since 1907 in various capacities initially having been made a Vice-President and Director in 1924. He is also an officer of several other companies, being both president and a director of Hooker-Detrex, Inc, a subsidiary of the Hooker Company.

Mr Murray has been with Hooker since 1916. He has been a Director since 1937 and is a Vice-President and Director of Hooker Detrex.

The New York executive offices of American Aniline Products, Inc has announced the appointment of JOE T BOHANNON, JR as manager of its Chattanooga Branch. Currently, a large and modern branch office, warehouse and finishing laboratory is in construction and plans also call for an expansion of the sales force proper and the acquisition of a full technical staff. The new quarters, at 4001 Rossville Blvd, are scheduled for occupancy in May.

Mr Bohannon joined American Aniline more than 13 years ago.

Charles M Robbins

The retirement of R TIEDEMANN as sales manager of Commonwealth Color & Chemical Co, New York, has been announced. His successor is CHARLES M ROBBINS, one of the company's Mid-West representatives for the past 12 years as well as manager of their Hosiery and Underwear Division. Mr Tiedemann will remain with the firm until May 1 in an advisory capacity.

Commonwealth has also announced the appointment of GEORGE D FRONMULLER, Research Supervisor for the past 7 years with Scott Paper Co, to the post of Laboratory Director.

George D Fronmuller

C W Bendigo

C W BENDIGO, editor-in-chief of *Textile World* for the past five years, has left to join the New Product Development Department of American Cyanamid Company, headed by Dr L P Moore. His principal assignment will reportedly be the studying of current developments in the field of synthetic fibers.

Mr Bendigo, a member of several trade associations including the AATCC is a veteran of twenty-five years in the textile industry, having begun his career in his father's throwing mill in Pennsylvania.

PRENTICE M THOMAS of Columbus, Ga succeeds Mr Bendigo at *Textile World*. He joined that publication's staff in 1945 as associate editor in the South.

As the first part of its long term expansion program, the Board of Directors of Colloids, Inc has announced the following changes in personnel:

HOWARD L SMITH, resident manager for the past four years of the Canadian subsidiary, Colloids of Canada Ltd, has been transferred to the home office in Newark, N J. He will be succeeded by HOWARD O WEST, advanced to acting manager. Mr Smith's present technical staff, functioning out of the Newark office, consists of JACK FERGUSON (dyeing and finishing), PHILIP SWARTZ (synthetic weaving and throwing) and FRANK H GLEASON (synthetic, paper and worsted mills), who will continue to service the Pennsylvania, New Jersey and Virginia areas. Additional sales representatives are now being recruited for sales training.

HERMAN C SELYA, who served as Colloids New England representative for the past seven years, has been appointed Manager of the newly established New England Division. A staff of sales technicians is now being formed, the first member of which is HENRY E TALBOT.

WILLIAM F MANN, JR continues as resident manager of Colloids of Carolina Inc, in High Point, N C and JUAN A ORNELAS, as director of Colloids de Mexico S A de C V in Mexico, D F.

HERBERT B WOODMAN, President of Interchemical Corporation, has for the fourth consecutive year accepted the Chairmanship of the Chemical & Paints Division of the Legal Aid Society's annual fund-raising campaign. The Society is asking for $300,000 to carry on its work of advising and representing those who cannot afford the services of an attorney in private practice.

GEORGE M WALKER has been named as assistant vice president in the Chemical Division of Koppers Company, Inc. THOMAS J McGINNIS has been appointed to succeed Mr Walker as the company's Control Section manager, moving up from the post of assistant manager.

In his new post, Mr Walker, who was attached to the Chemical Division until four years ago, will give particular attention to planning and executing the expansion of the Chemical Division's activities. He joined Koppers in 1929. Mr McGinnis joined the company as an organization administrator in the Control Section following World War II.

TECHNICAL LITERATURE

The following three papers, covering results of research on hydroxyfuchsone dyes by Soviet chemist I S Ioffe and associates, have been published individually in complete English translation by Consultants Bureau, 152 West 42nd Street, New York 18, New York. Translations are available at a cost of $5.00 each.

INVESTIGATIONS OF HYDROXYFUCHSONE DYES. VII. *Monomethoxybenzaurin.*

I S Ioffe, *Journal of General Chemistry of the U S S R*, May, 1949.

In order to obtain 3-methoxybenzaurin, a mixture of benzaldehyde, phenol and guaiacol was saturated with dry hydrogen chloride and stored for several days. The sought-for triphenylmethane derivative was separated from the reaction medium as crystals with a m p of 166-168°; the acetyl derivative melts at 100-102°C. From the triphenylmethane derivative described, by oxidation with amyl nitrite in an amyl acetate solution, 3-methoxybenzaurin was obtained, having a low-melting hydrated form and in the anhydro form melting at 158-160°. Alkaline solutions of this dye are colored violet; it dissolves with a crimson color in strong hydrochloric acid. In the un-ionized form it forms light yellow solutions, similar to solutions of benzaurin and its dimethoxy derivative.

INVESTIGATIONS OF HYDROXYFUCHSONE DYES. VIII. *New Data on Fuchsone and 3-Methoxy-Fuchsone.*

I S Ioffe and Z Ya Khavin. *Journal of General Chemistry of the U S S R*, May, 1949.

Description of a new method for dehydration of hydroxytriaryl carbinols, by boiling these substances with glacial acetic acid, followed by distillation of the acid in vacuo. Fuchsone and 3-methoxyfuchsone were obtained with excellent yields and in a pure state. It was established that 4,4'-dihydroxytetraphenylmethane, formed as a byproduct in the condensation of benzophenone chloride with phenol according to the method of Homberg and Gikling, accumulates in the reaction medium not only in the first stage of the condensation, but also in the succeeding steam-distillation of the reaction product. A new and more convenient method is described for separating the corresponding hydroxytriarylcarbinols or fuchsones from mixtures of the reaction products of benzophenone chloride with phenols. The method is based on the direct formation of the bisulfite derivatives of the fuchsones from these mixtures, followed by their decomposition. It was found that by the careful hydrolysis of solutions of onium salts of fuchsones, their hydrated forms, not yet described in the literature, are obtained, and are distinguished by their instability and their conversion to the corresponding hydroxy-triarylcarbinols by drying or upon standing. A new method for the preparation of hydroxytriarylmethanes is described, based on the reaction of benzohydrol with phenols in the presence of dry hydrogen chloride gas, and resulting in higher yields of the final products than is known in the literature.

INVESTIGATIONS IN THE FIELD OF HYDROXYFUCHSONE DYES. IX. *Structure and Color Properties of Hydroxymethoxy Fuchsones.*

I S Ioffe and A F Sukhina, *Journal of General Chemistry of the U S S R*, June, 1949.

A comparison of the structure and color-producing properties of fuchsone and methoxy-fuchsone, of benzaurin and its methoxy derivatives, and of aurin and its methoxy derivatives, containing one or several methoxy groups in the ortho position to the oxo group of hydroxy group.

New circulars released by General Dyestuff Corporation, 435 Hudson Street, New York 14, N Y are listed below. (See "New Products" Section for product descriptions.)

G-646—Celliton Discharge Blue 5GA

G-651—Algosol Golden Orange IRR-CF

G-658—Algosol Grey IHL-CF

G-661—Celliton Fast Red GGA Extra Cons CF

G-666—Celliton Fast Red GGA Extra Conc for Printing

January Issue, Bibliography of Technical Reports—features a Naval Research Laboratory article including, among other reports, developments in the correlation of fungicidal activity with the chemical structure of organic materials, researches on infrared phosphors, and surface chemical phenomena in lubrication.

January "Technical Reports Newsletter"—Naval Research Laboratory reports covering such developments as silicone lubricants, etc. Other items relate, among others, to wrinkle finishes and the abrasion resistance to nylon webbing.

Both of the above are available from the Office of Technical Services, U S Department of Commerce, Washington 25, D C. The Bibliography costs 50c; the newsletter is available on request.

"Experimetrics" — Experimetrics, Inc, Station I, Buffalo 22, N Y—A detailed report on benefits and savings resulting from modern statistical methods. Sections are devoted to designed experiments, correlation analysis, quality control, and Experimetrics service.

Potato Starch Bulletin — Morningstar, Nicol, Inc, 630 West 51st Street, New York 19, N Y, 4 pages in loose leaf form —gives facts on the advantages and properties of potato starch and techniques applicable to textile processing.

Calco Bulletin No 817, "Studies of Wool Dyeing: The Influence of the Cuticle in the Dyeing of the Wool Fiber"—H E Millson and L H Turl, American Cyanamid Company, Calco Chemical Division, Bound Brook, N J (Write to Advertising Department).—Studies of the influence of the scale structure of a wool fiber on dye penetration and results of experiments undertaken to obtain more uniform distribution of dye along the length of the fiber.

Bulletin on Tanak Synthetic Tanning Agents — Industrial Chemicals Division, American Cyanamid Company, 30 Rockefeller Plaza, New York 20, N Y.—a history of naphthalene type syntans, mechanism of syntan chemistry and applications of those syntans in conjunction with chrome and vegetable tannages. Grades, analyses and typical applications are given.

Niaproof Water-repellent Finishes — Carbide & Carbon Chemicals Division, Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N Y. —description of how to apply Niaproof water-repellent finishes to clothing, rainwear, sporting and canvas goods, house furnishings, linens and other textiles.

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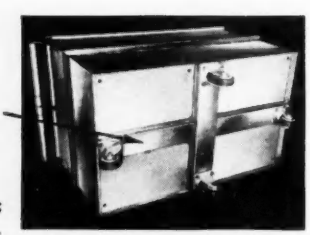

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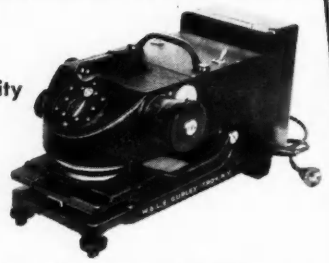

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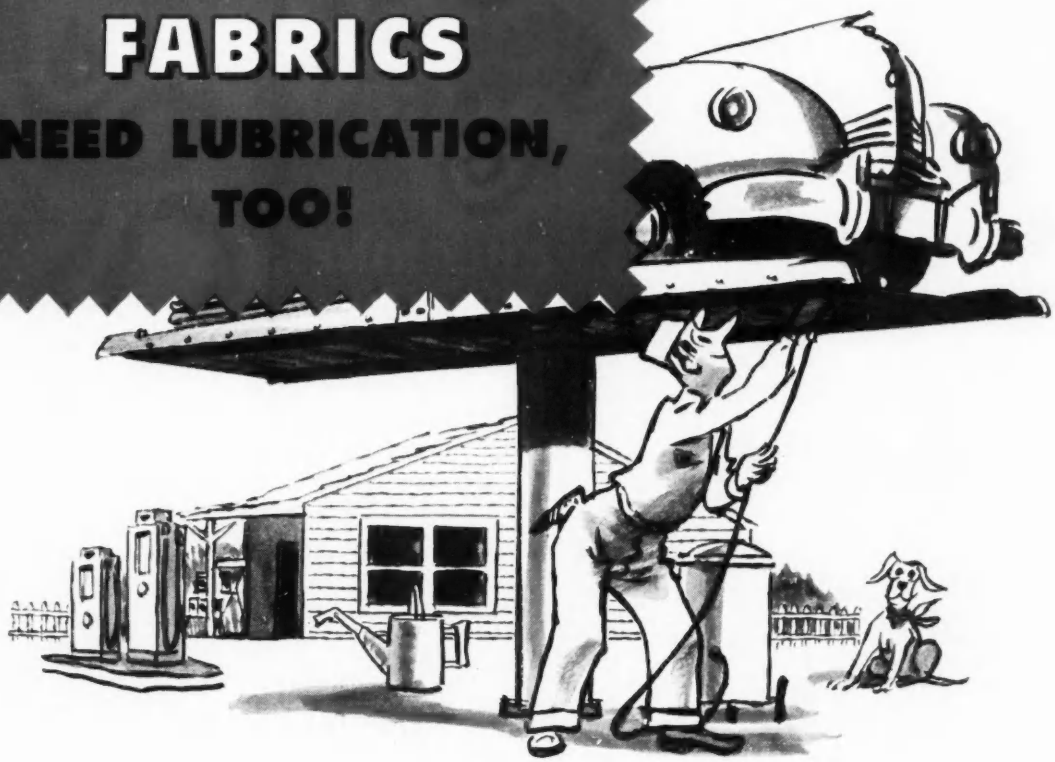

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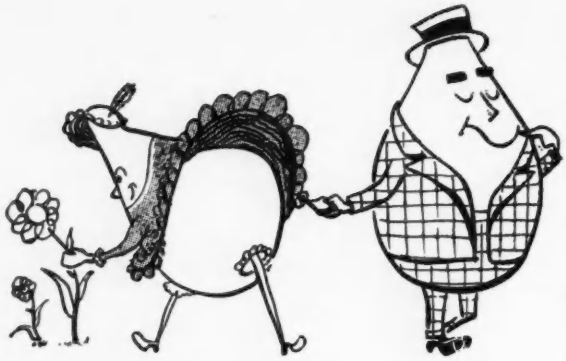

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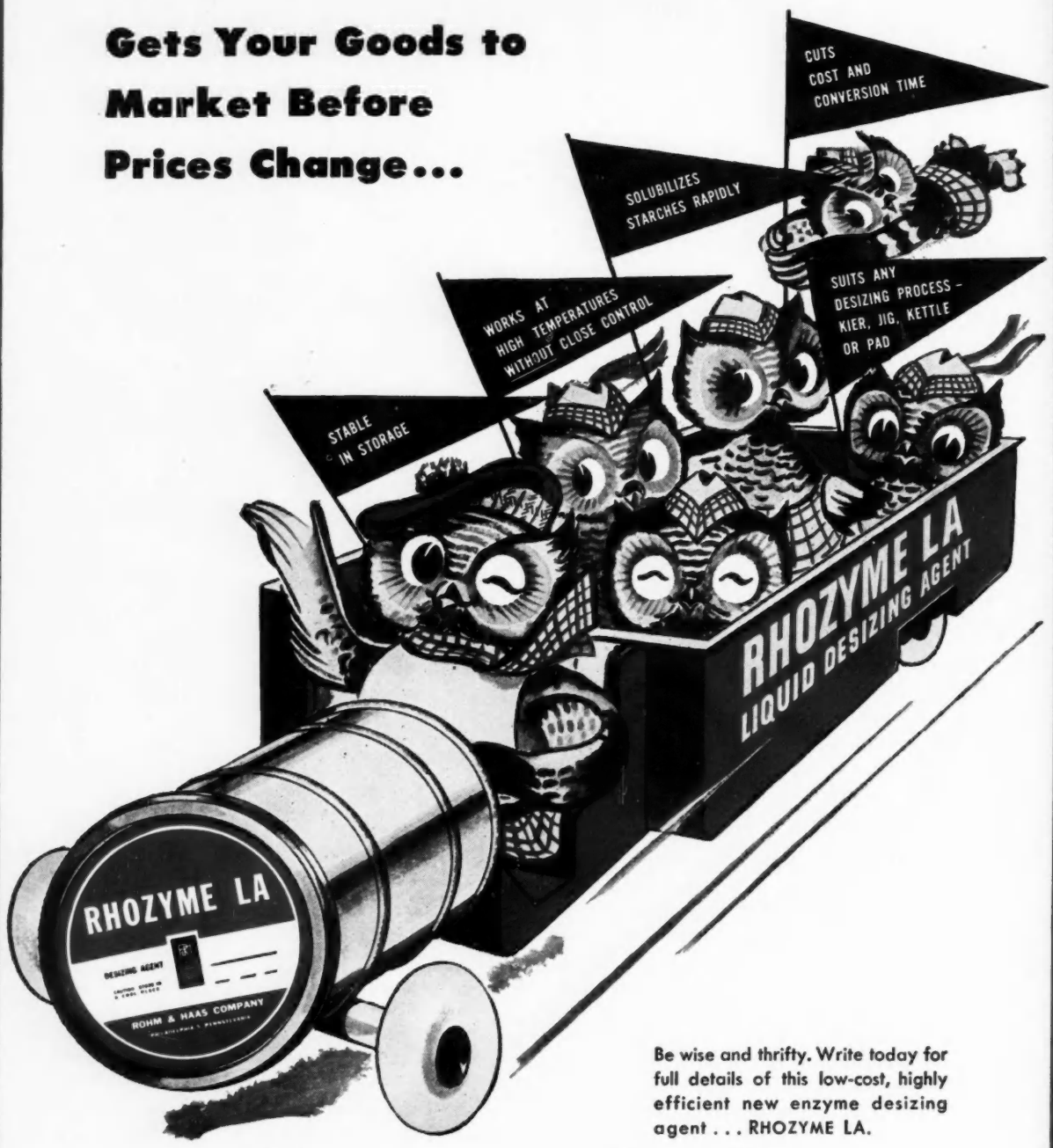

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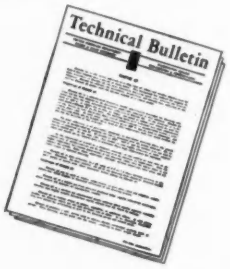

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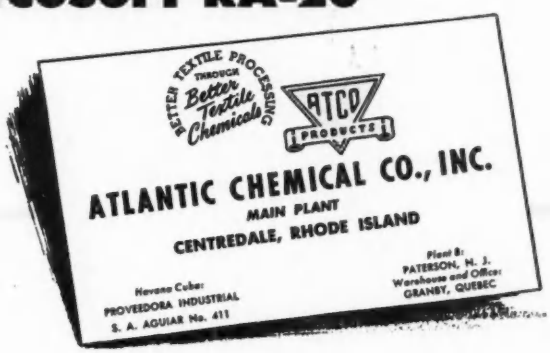

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